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The Journal

OF THE

Ministry of Agriculture

SEPTEMBER, 1921.

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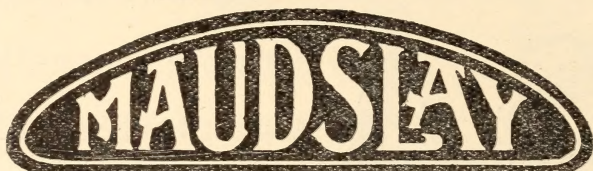
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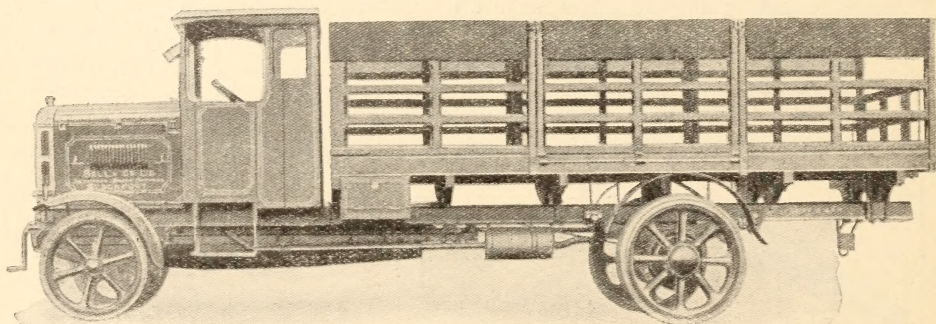
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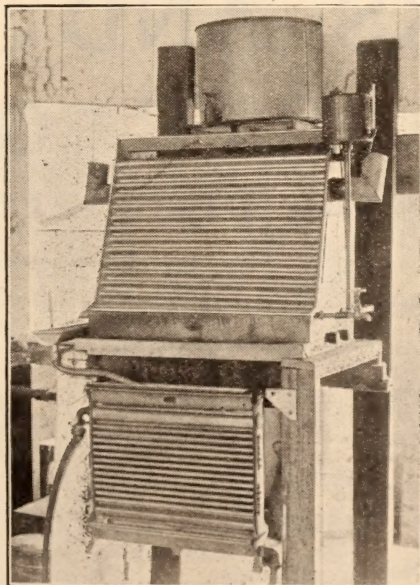
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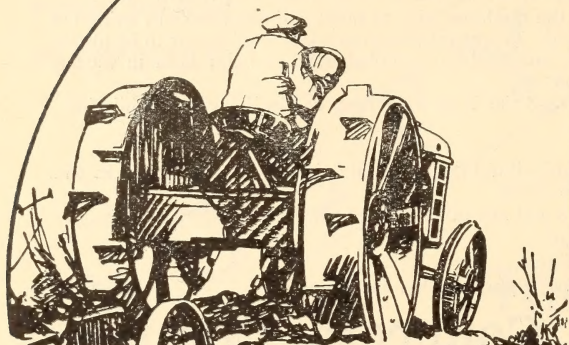
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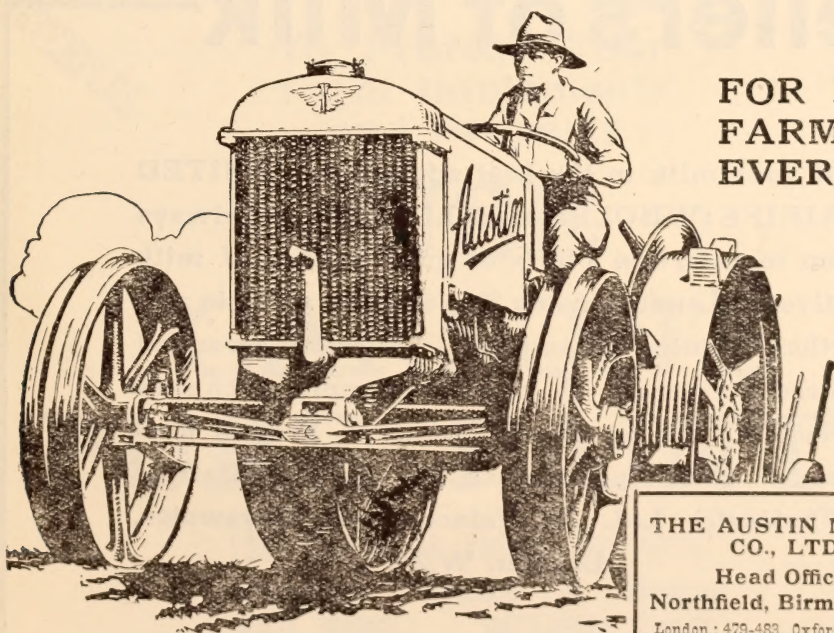
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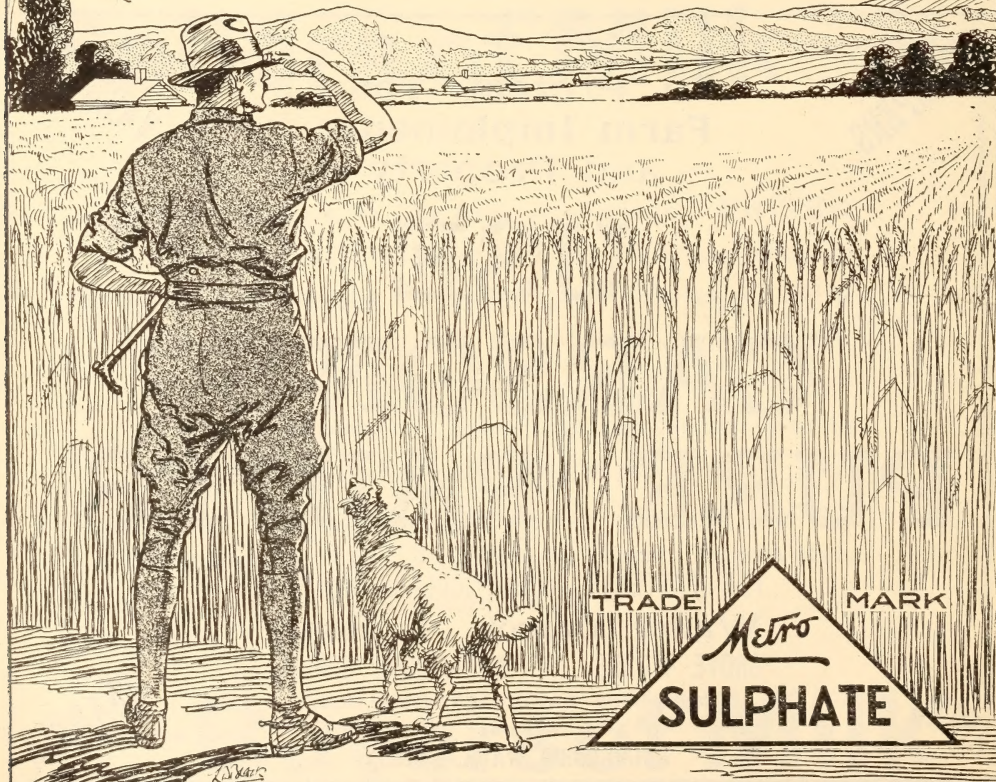
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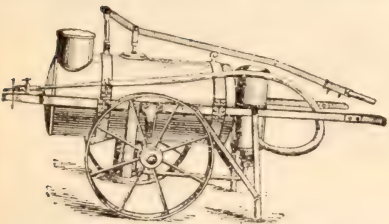
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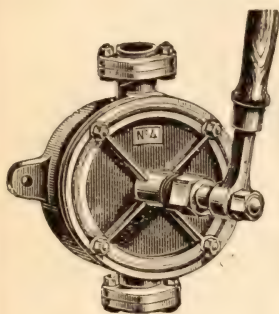


Crop.	Sulphate of Ammonia— Quantity applied.	Increased Yield.	Percentage Increase.
POTATOES	1½ CWT. PER ACRE.	6½ TONS PER ACRE.	35 PER CENT.
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OATS	1 " " "	58½ " "	118 " "

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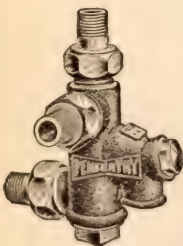


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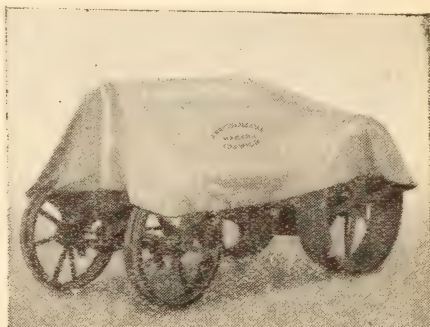
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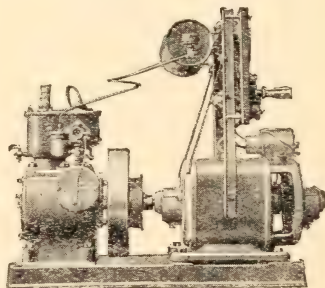
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THE JOURNAL OF THE MINISTRY OF AGRICULTURE

Vol. XXVIII. No. 6.

SEPTEMBER, 1921.

NOTES FOR THE MONTH.

THIS Act has now received the Royal Assent and comes into operation on 1st October, 1921. The main provisions of the

**Corn Production
Acts (Repeal) Act,
1921.**

Bill as it then was were summarised in this *Journal* for August last (p. 385); certain changes were subsequently made but these have mainly related to Section 4. A memorandum explaining the provisions of this section as regards the formation of Conciliation Committees in Agriculture appears on p. 488 of this issue.

* * * * *

ON the 8th August, 1921, Sir F. Hall asked the Minister of Agriculture in the House of Commons what steps were taken by

**Wheat and Oats
(Payment Claims).**

his Department to notify the growers of wheat and oats of their right to claim the payments provided for under Clause 2 of the Corn Production Acts (Repeal) Bill; what period was allowed during which claims might be made; and what action he proposes to take in regard to claims sent in after the expiration of that period?

In reply Lieut.-Col. The Rt. Hon. Sir Arthur Griffith-Boscawen, Minister of Agriculture, said "that very wide publicity was given to the requirements with regard to claims in respect of the minimum prices of wheat and oats under the Corn Production Acts. A form of claim was sent at the end of May or beginning of June to every occupier of an agricultural holding exceeding one acre, and notices explaining the contents of the form and emphasising the importance of the claim being made before the 30th June were issued to London and provincial newspapers to the number of about 750 on the 21st May, 18th June, and 25th June. On the 21st June, moreover, a special notice was issued with a covering memorandum to editors of newspapers, asking them to give it prominence. In deference to representations which were made that many growers of wheat and oats were unable to complete their claims by the 30th June,

it was decided that claims might be made up to and including the 18th July, and a notice to this effect was issued on the 28th June, in which growers were warned that no further extension of time would be granted. In addition to the notices issued to the Press, notices were also published in the April, May, and June issues of the *Journal* of the Ministry.

It was necessary that a final date for the receipt of claims should be fixed, in order that they may be examined by the county committees as far as possible before the land is ploughed up, and, in view of the long period allowed in which to make a claim, I feel that farmers who failed to send in their claims by the prescribed date have no legitimate grievance. I do not propose, therefore, to accept claims made after 18th July, except where the occupier entered into occupation of the land after the 30th June."

* * * * *

IN the last number of the *Journal* (p. 398), there appeared an article on this subject which deserves the attention of practical agriculturists. The results obtained constitute one of the most notable advances in knowledge of the principles of agricultural practice that have been made in recent years.

The Production of Artificial Farm-yard Manure.

Interesting as the subject of "artificial" farmyard manure must be—especially for the market gardener—the advance in knowledge regarding the principles which underlie farm practice in relation to ordinary yard manure is equally noteworthy. It is now made clear that Nature, if left to herself, turns out a product which is practically of constant fertilising value. The making of dung is essentially a process for rotting straw. The latest advance of science confirms the wisdom of age-long practice—the addition of animal urine is the best way of rotting straw and producing the most essential of all fertilising agents. So much for theory, what of practice?

The discoveries that have been made establish, first of all, that under *ordinary* conditions of making and application it makes little difference whether dung is made from "cake fed" animals or not. A certain quantity of straw will give a certain amount of dung of a uniform fertilising value, and, secondly, if, as a result of feeding cake, the animals produce a richer urine, the best way of retaining the added richness during the period that ordinarily elapses between making (*i.e.*, thorough rotting) and application, is to *use more straw in the litter*. Unless this is done the additional fertilising value (nitrogen) may be lost in the air.

In fact, it would seem to follow that there is no necessary connection between the richness of the food consumed by farm stock and the value of the resulting dung as a fertiliser after storage for several months in the manner usually practised, *unless an adequate quantity of straw has been supplied as litter*. That is to say, the more or richer the food used, the greater must be the amount of straw used as litter, otherwise the increased fertilising value of the excrement is likely to be lost. If further investigation confirms this view, existing practice relating to farm valuations may have to be modified.

Next, the discoveries made by Messrs. Hutchinson and Richards point to a method whereby the ever-increasing shortage of farmyard manure may possibly be met. They have shown how it is possible to produce from straw a material which has the appearance and most of the properties of the natural product. Their investigations render the process an orderly one: the quantities of the various materials to be used, and the conditions under which successful results will be obtained, are laid down precisely.

* * * * *

THE preliminary statement of Acreage under Crops and Number of Live Stock in England and Wales was issued on the 8th August last and is printed on p. 572 of this issue.

**Preliminary
Estimates of
Acreage under
Crops and
Number of Live
Stock.**

The preliminary tabulation of the Agricultural Returns collected on the 4th June, 1921, in respect of agricultural holdings of over one acre in England and Wales shows that the total area under all crops and grass

is 26,139,000 acres, a decrease since last year of 368,000 acres. On the other hand, the area of rough grazings (which comprises mountain, heath, moor, down and other rough land used for grazing) is now 4,555,000 acres, or 393,000 acres more than at the same date in 1920. Of the "farmed" area of 26,139,000 acres, arable land accounts for 11,618,000 acres and permanent grass for 14,521,000 acres.

The outstanding feature of the returns is a marked decline in the area of arable land, which, however, still remains the largest since 1905, excluding the years 1918-20 when the ploughed area was greatly increased as a result of the food production campaign. The majority of the crops contributed to the decline in the arable area, a noteworthy exception being wheat, the area of which shows a substantial increase. There are satisfactory increases in the case of each class of breeding stock (cows, heifers, ewes,

and sows) and in the total numbers of sheep and pigs, while there is a very marked improvement in the number of calves.

* * * * *

CONSIDERABLE interest has been aroused in the phosphates of Ocean and Nauru Islands. The phosphates produced in

Nauru Phosphate. these Islands have since the War become Imperial property on the basis that the United Kingdom has a claim to 42 per cent. of the output at cost price, Australia to 42 per cent., and New Zealand to 16 per cent. The phosphates from the two Islands are almost identical in composition and origin, and have arisen from the interaction of the excreta of sea-birds with the coral rock of the Islands. While they cannot properly be described as guano, they have originated from guano, contain 85 to 89 per cent. of phosphate of lime calculated as tri-basic phosphate of lime, and are very free from iron and alumina. Both the physical and chemical character of the material is such as to render it readily soluble and available for growing crops

Owing to the shortage of high-grade basic slag, a shortage which is more pronounced because of the increased interest in the improvement of grass-land, the question of the availability of other phosphates is being closely considered. Many experiments show that finely-ground rock phosphates will do the work of the basic slag and encourage the growth of clovers in the same way, especially on old grass-land which is well provided with organic matter, and where the rainfall is abundant. Recent experiments in Essex, where the conditions are comparatively unfavourable, show that the action of rock phosphates compares favourably with that of basic slag. In America, the use of ground rock phosphates has become very general. Actual trials with these particular phosphates from the Pacific Islands have as yet only been reported from New Zealand, but there is every reason to suppose that they will be even more effective than the ordinary rock phosphates.

The control of the phosphates of Nauru and Ocean Islands has been vested in Commissioners, who have arranged with a Company to take the whole of the output allotted by the Commissioners to the United Kingdom. This Company has arranged to distribute it, mixed with basic slag in such a manner as to supply the farmer with grades of finely-ground material containing a minimum of 40 per cent. to a maximum of 65 per cent. of phosphates. When required it can be supplied free from admixture with basic slag, with a guarantee of 80 to 85 per cent. of phosphates.

The mixture supplies the farmer with a finely-ground material which will act as an effective fertiliser in practically all cases where basic slag is of value. Steps have been taken in the contract of sale to limit the profit which the manufacturer of this product can make, and the British farmer will obtain the advantage of getting the richest phosphate in the world at a price which represents only the cost of production and a reasonable profit to the grinder and distributor.

The Ministry of Agriculture has no hesitation in recommending farmers to try the mixture of the Nauru and Ocean Islands phosphate and slag for application to grass-land at the rate of 4 to 6 cwt. per acre according to grade, especially upon heavy soils, peaty soils, and all situations where the rainfall is not too light. On arable land, the mixture cannot always take the place of superphosphate for the turnip crop, but a dressing of 4 cwt. per acre will form a good basis of continuously acting phosphatic manure for the whole of the rotation. A further 2 cwt. per acre of superphosphate, drilled with the seed for the turnip crop, will give it that initial start for which superphosphate is so valuable.

As a means of establishing a stock of phosphates in the soil, the mixture is a cheap source of phosphoric acid. At current prices, it costs from 2s. 6d. to 3s. per unit of phosphate of lime delivered to the farmer's nearest station, whereas basic slag (30/32 per cent. total phosphate) costs 4s. 3d. or (20/22 per cent. total phosphate) 4s., and superphosphate (30 per cent. total phosphate) 4s. per unit. The mixture has the further advantage, from its richness, of reducing the charges for freight, carriage, cartage and handling on the farm.

Further experiments have been started to ascertain more accurately the applicability of the Nauru and Ocean Islands phosphate to particular soils and crops. Sufficient knowledge already exists, however, to enable the Ministry to recommend with confidence Nauru and Ocean Islands phosphate to the farmer who wishes to improve his grass-land and to lay a good manurial foundation for his arable land.

* * * * *

THE Sale of Diseased Plants Order, 1921, has recently been made by the Minister of Agriculture and Fisheries with the

**Sale of Diseased
Plants Order,
1921.**

object of preventing the sale of diseased plants in England and Wales. It prohibits the sale of any plants or parts thereof which are substantially attacked by any of the pests named below :—

A. Fruit and other Tree Pests.

Fruit Tree Cankers (produced by *Nectria ditissima*, Tul., or any species of *Monilia*).

Silver Leaf (*Stereum purpureum*, Pers.).

Black Currant Mite (*Eriophyes ribis*, Nal.).

Woolly Aphis (*Eriosoma lanigerum*, Hausm.).

All Scale Insects (*Coccidæ*).

Brown Tail Moth (*Nygmia Phæorrhæa*, Dan.). (*Euproctis chrysorrhæa*).

Rhododendron Fly (*Leptobyrsa (Stephanitis) rhododendri*, Horv.).

B. Vegetable and Root Pest.

Potato Blackleg (*Bacillus atrosepticus*, Van Hall).

The sale of plants, &c., attacked by—

American Gooseberry Mildew (*Sphærotheca morsuvæ*, Berk.),

Wart Disease of Potatoes (*Synchytrium endobioticum*, Perc.), or

Onion and Leek Smut (*Urocystis cepulæ*, Frost),

is prohibited under previous Orders.

The Order comes into operation on 1st October, 1921. Further information may be obtained from the Ministry, Whitehall Place, London, S.W.1.

* * * * *

DURING the past season 1,534 packets of seed were drawn by the Ministry's Inspectors and forwarded to the Official Seed Testing Station for check tests to be carried out, as compared with 718 samples taken in the previous season. The results of the tests show a slight improvement on last year's figures, and may be summarised as follows (the figures are percentages):—

	Season 1919-20.	Season 1920-21.
Up to and above Standard of germination authorised by the Testing of Seeds Order, 1918	77.7	80.4
Below Standard but above two-thirds	14.9	13.2
Below two-thirds of the Standard	7.4	6.4

Under the Testing of Seeds Order it was not obligatory for the seller to declare the date on which the seeds were packeted, and the comparatively high percentage of packets containing seed of low germination may possibly be explained by the existence in the country of large stocks of packets of seed one year old or more. Under the Seeds Act, 1920, and the Regulations made thereunder, the vendor of packeted seeds may declare the neces-

sary particulars as to purity, germination, date of tests, etc., as prescribed for the particular kind of seed, or he may avail himself of the special provisions made for the sale of packets, in which case the date of the season in which the seeds were packeted must be declared. It is hoped that this practice will lead to the discontinuance of sale of old seed in packets.

* * * * *

THE Minister of Agriculture and Fisheries and the Secretary for Scotland have appointed a Committee to investigate the present position as regards the provision by local authorities of allotments in Great Britain and to formulate recommendations for such amendments of the existing legislation and administration as may be desirable to secure adequate provision of allotments by such local authorities and to improve the tenure and security of occupiers of allotments.

The Committee will be constituted as follows :—

The Rt. Hon. the Earl of Ancaster, Parliamentary Secretary to the Ministry of Agriculture and Fisheries (Chairman).

Sir John Lorne Macleod, G.B.E., ex-Lord Provost of Edinburgh.

W. Bagshaw, Esq., O.B.E., Town Clerk of Doncaster.

Archibald W. Fisher, Esq., Secretary, Scottish National Union of Allotment Holders.

J. Forbes, Esq., General Secretary, National Union of Allotment Holders.

John Gilchrist, Esq., F.S.I., Bellshill, Lanarkshire.

Alderman G. A. Hemmings, Chairman of the Allotments Committee of the Swansea Borough Council.

D. A. Nicholl, Esq., M.A., LL.B., Town Clerk of Wandsworth.

George Nicholls, Esq., O.B.E., Director of the Small Holdings and Allotments Section, Agricultural Organisation Society.

Major W. G. Prescott, M.P. for North Tottenham.

G. I. Simey, Esq., Clerk to the Somerset County Council.

The Secretary of the Committee is Mr. E. Lawrence Mitchell (Ministry of Agriculture and Fisheries), to whom all communications should be addressed.

CONCILIATION COMMITTEES IN AGRICULTURE.

THE following Memorandum explains the provisions of Section 4 of the Corn Production Acts (Repeal) Act, 1921, but it is not in any sense a legal interpretation of its terms.

1. The Act cited above brings to an end as from 1st October, 1921, the Agricultural Wages Board and the District Wages Committees. In place of these, the Act provides for the formation of local joint Conciliation Committees in various areas for the purposes and with the powers described below, and the Minister of Agriculture is empowered by the Act to take such steps as he may think best calculated to secure the voluntary formation and continuance of the Conciliation Committees.

2. The Conciliation Committees will consist of representatives of employers and of workmen, and they will deal with rates of wages, hours of labour and conditions of employment.

3. Until a Conciliation Committee as above is formed in an area, the persons who on the date of the passing of the Act were representatives of employers and workmen (but not the appointed members) on the District Wages Committee for the area will be an Interim Conciliation Committee for any part of the area for which a Conciliation Committee has not been formed. No such Interim Committee may continue after two years from date of passing of Act.

4. Any vacancy occurring on an Interim Conciliation Committee will be filled by the Organisation by whom the vacating member was nominated, and until December 1st, 1921, any member of an Interim Conciliation Committee may be replaced by some other representative of the Organisation (either of employers or of workmen) by which he was nominated to the District Wages Committee.

5. The representatives of employers and workmen will respectively have one collective vote on any question. In other words, no resolution will be regarded as carried unless it has been approved by a majority of the members on each side.

6. A Conciliation Committee may appoint an independent Chairman. The Chairman so appointed may not be given power to vote except in respect to any particular matter as the Committee may determine.

7. It is contemplated that, by agreement, Conciliation Committees may be formed for smaller areas than those of the present District Wages Committee, and a Committee may make separate agreements for any part of the area for which it is formed.

8. Conciliation Committees constituted as above are empowered under the Act to deal with wages, hours of labour or conditions of employment in Agriculture in their respective areas. They may agree upon rates of wages for any class of person employed in the district or in any part of the district for which the Committee is formed, and may fix special rates of wages for special classes of workmen or may provide for the exemption, on account of special circumstances, of particular classes of workmen from the rates agreed upon.

9. When a Conciliation Committee has agreed upon a rate of wages, it may, if it so agrees, submit the agreement to the Minister of Agriculture for confirmation. The Minister may thereupon confirm the agreement, and cause it to be advertised in the district to which it applies, with particulars of the date from which, and the period for which, it is to operate.

10. A rate of wages having been agreed upon by a Conciliation Committee, and confirmed and advertised by the Minister of Agriculture, it becomes, for so long as the agreement is in operation, an implied term of every contract for the employment in the district of a workman of any class to which the agreement applies that the employer shall pay to that workman wages at not less than the rate payable under the agreement.

11. Nothing in any contract for the employment of a workman shall operate to deprive the workman of his right to receive wages at the rate agreed upon by the Conciliation Committee and duly confirmed and advertised except:—

- (a) where the Conciliation Committee or a Sub-Committee thereof is satisfied that the contract for payment of wages at a lower rate is, having regard to any special circumstances affecting the workman or to the special terms of the contract, fair and reasonable, and issues a certificate accordingly; or
- (b) where, on an application for such a certificate, the Committee or Sub-Committee has failed to agree with respect to the matter, and the Court in which proceedings are taken for the recovery of wages at the rate agreed by the Committee, is so satisfied as aforesaid; and then only to the extent to which the Conciliation Committee or Sub-Committee certifies or the Court determines that the wages payable should be at some lower rate than the rate so agreed by the Committee.

12. Proceedings may be taken in a Court of law for the recovery of arrears of wages at the rate agreed by the Conciliation Committee. Such proceedings must be commenced within three

months after the date when the workman left the employment and a person will not be entitled to recover wages for more than three months or for such longer period not exceeding one year as the Court shall consider just.

13. For the purposes of this section of the Act, the expression "agriculture" includes dairy farming and the use of land as grazing, meadow or pasture land or orchard or osier land or for market gardens or nursery grounds, but not woodlands or woodland nurseries and the expression "agricultural" is to be construed accordingly. The expression "workmen" includes boys, women and girls. The expression "employment" means employment under a contract of service or apprenticeship, and the expressions "employ" and "employer" are to be construed accordingly.

In connection with the Conciliation Committees referred to above, the Minister has addressed the following letter, dated August 13th, 1921, to representative members of the existing District Wages Committees :—

Dear Sir,

You are doubtless already aware of the provisions of the Corn Production Acts (Repeal) Bill, which has now passed through all its stages in the House of Lords.

The effect of the Bill is to terminate the Agricultural Wages Board and the District Wages Committees, but the Minister of Agriculture is empowered to take such steps as he may consider best adapted for securing the establishment by agreement of Local Joint Conciliation Committees throughout England and Wales for the purpose of dealing with wages and hours of labour. I am very anxious that all the necessary preliminary arrangements for giving effect to the Act should be made without delay and with the fullest co-operation of all concerned, and as a first step I have felt it to be essential to acquaint you and all other representative members of the present District Wages Committees of the position.

Subject to the provisions of Clause 4 (2), it is provided by the Bill that the members of the District Wages Committee for a particular area, who at the date of the passing of the Act represent the employers and workpeople respectively (but not the appointed members) shall be a Joint Conciliation Committee for the time being until a permanent Conciliation Committee has been set up, and accordingly I have to ask whether you will be good enough to act as a member of the Interim Committee for

your area. As you are probably aware, the rates in operation under the Orders of the Agricultural Wages Board will, on the Bill becoming law, cease to have effect as statutory rates as from the 1st October next. In my view it is of the utmost importance that the representative members of the District Wages Committee should meet as an Interim Joint Conciliation Committee at the earliest possible date with a view to entering into an agreement as to the conditions that are to operate in their area as from the 1st October and for such period as may be agreed upon. In this connection the Committee is empowered under Clause 4 (3) of the Bill to make agreements for the whole or for any part of the area for which the Committee is at present acting. Having regard to the short time that is available between now and the 1st October, I need hardly urge upon you the importance, in the interests of the industry, of the Interim Joint Conciliation Committee making arrangements on the lines I have indicated above so that no difficulty may arise in the area owing to the cessation of the Wages Board. It will also be appreciated that a temporary arrangement of this kind will give time during which a permanent Committee can be set up, consideration given to the formation of new areas where necessary, and any other difficulties solved.

The Interim Joint Conciliation Committee will, in the circumstances of the case, start without a Secretary, and in order to assist the Committee I am giving instructions that the Secretary of the District Wages Committee shall place his services at the disposal of the Joint Conciliation Committee up to the 30th September or until arrangements have been made by the latter for carrying on the necessary secretarial work. The Secretary of the District Wages Committee is accordingly being requested to make the necessary arrangements for convening the first meeting of the Conciliation Committee at as early a date as possible, and he will send you a communication in due course.

I avail myself of this opportunity to express my thanks to you for the services you have rendered as a representative member of the District Wages Committee for your district, and I hope that you may be able to see your way to attend the meeting of the Interim Conciliation Committee which will shortly be called.

Yours faithfully,

ARTHUR G. BOSCAWEN.

THE NEW FARM INSTITUTES.

SIR DANIEL HALL, K.C.B., F.R.S.,

Chief Scientific Adviser, Ministry of Agriculture and Fisheries.

THE coming autumn will see a welcome increase in the number of Farm Institutes. The number of complete Institutes which were at work during the session which is just over was four, viz., the East Anglian Institute of Agriculture, Chelmsford (Essex County Council); Newton Rigg (Cumberland and Westmorland County Councils); Madryn (Carnarvonshire); and Sparsholt (Hants County Council). Instruction of a Farm Institute type was also given at the Monmouthshire Agricultural Institution at Usk. Seven new schemes should be completed in time to start work next month (October), bringing the total to twelve. Six of the new Institutes are being provided by County Councils:—Reaseheath (Cheshire); the Agricultural Institute, St. Albans (Herts); Moulton Grounds (Northants); Rodbaston (Staffs); Cannington Court (Somerset); and Llysfas (Denbigh). One Institute (Little Chadacre, Suffolk), is a gift from Lord Iveagh, who has generously made himself responsible for the entire cost, initial and annual.

The position would have been still more favourable if it had not been for the Cabinet Veto on new Schemes relegating to abeyance six other schemes which could not be considered as "in operation" at the time the halt was called. It is hoped that the new fund, which will be established when Clause 3 of the Corn Production Acts (Repeal) Bill becomes law, will enable these schemes "in abeyance" and a further four or five new Schemes to be proceeded with.

It is thirteen years ago since the idea of Farm Institutes was originally put forward in the Report of the Departmental Committee on Agricultural Education, presided over by Lord Reay [Cd. 4206—1908]. The progress seems slow, but when allowance is made for the set-back caused by the War and its financial legacies the start that has been made is not unsatisfactory.

Winter Courses.—The Farm Institute is regarded by the Ministry as a most necessary agency for the instruction of the majority of future occupiers of the land, and the chief intelligence centre in each district to meet the current requirements of the industry for information and advice. From the educational side the Farm Institute is distinct from an Agricultural College in that it aims at giving instruction by means of short winter courses which will not involve any long absence of the student from the farm. As a rule a course of instruction is covered

by two terms of about twelve weeks each, before and after the New Year, which may be taken consecutively or with a year's interval between the first and second. Probably, a third term would cover the subject more adequately, and the ideal system might well be one under which a student left his farm and spent one term at the Institute in each of three consecutive years, thus maintaining the educational stimulus over a considerable portion of the formative part of his life. It is realised, however, that any arrangement of this kind would be hard to reconcile, on administrative grounds, with the necessity for keeping the accommodation filled and so ensuring that the fixed overhead charges are spread over as large a number of students as possible. Until the Institutes have grown sufficiently to permit of other organisation, the normal course will probably consist of two, or in some cases three, consecutive terms.

As the instruction given by a Farm Institute takes place in the winter months, and as it is intended for young people coming from farms, it should not be thought of as providing a complete training in manual operations, or what is sometimes called practical work upon a farm. Most of the Institutes have farms of considerable size attached to them, and students will be required to take part, under supervision, in seasonal practical work on the farm, with the stock, or in the dairy, gardens, etc. Participation in such practical work will, however, be for the purpose of illustrating the general principles taught in the class-room and the laboratory, and not for the purpose of turning out a skilled manual worker. The student should obtain his practice in actual farm operations upon his home farm; the object of the Institute course is to awaken a student's intelligence with regard to those operations and provide him with the kind of information that he cannot get by following the routine of any single farm. For example, the Institute courses would treat of methods of cultivation and rotations from the point of view of results and costs, with the choice of seed and new varieties, and with the varieties of fodder crops to suit particular soils and systems of farming. The student would be taught the functions of different fertilisers, their selection and purchase, and the meaning of an analysis. Similarly, the choice and purchase of feeding stuffs, and the main principles of feeding and breeding would be treated. Above all, he should early be introduced to the meaning and value of farm book-keeping, and to the necessity of checking the operations of farming by costs. The Institute farm would not be used for direct teaching, but its records would provide a basis for much of the instruction on management.

Summer Courses.—Having devoted the winter months to the education of farmer's sons, and incidentally of a few women who wished to farm on their own account, the Farm Institute should provide a third course of three or four months' duration in the summer for the instruction of the farmer's wife or daughter. The object of the course should be to render the woman student an efficient partner in the management of a small farm. The course of instruction on the agricultural side would deal with the care of live stock, especially dairy cows, poultry and pigs, and with the management of a dairy and garden. The domestic side of the course should include the preservation of foodstuffs, *e.g.*, jam-making, fruit-bottling, bacon-curing, cooking and housewifery generally—whatever is necessary to make the woman an efficient participator in the economy of a farm. It should not aim at teaching women to farm; those who so desire should share in the men's course of instruction.

General Assistance and Advice.—While the Farm Institute should thus be the centre for instruction by means of short courses, it should also become the permanent place of assembly of the various instructors working in the county area. Farmers should be encouraged to call there and bring their difficulties; special lectures and discussions for farmers should be held, and old students led to form the habit of turning to the Institute for advice. The farm with which an Institute should properly be equipped, while providing material for teaching as indicated above, should also be a centre for more permanent experiments and demonstrations than can usually be carried out co-operatively with farmers in the area. For example farmers ought always to be able to see trials of the newer varieties of cereals and other farm crops.

The Somerset County Council's Institute at Cannington Court was described in the March, 1920, issue of this *Journal*, and an article describing the Staffordshire County Council's Farm Institute at Rodbaston is printed at p. 495 of this issue.

A preliminary notice regarding Farm Institute courses which will commence in the ensuing autumn has been printed separately and is obtainable on demand. As the new Institutes provide additional residential accommodation for only some 150 to 175 students, and as the flow of students to all kinds of educational institutions, including those of agricultural education, shows little signs of abating, it is very desirable that early application should be made by all who wish to avail themselves of the facilities provided at Farm Institutes.

THE STAFFORDSHIRE FARM INSTITUTE, RODBASTON.

J. C. RUSHTON, F.H.A.S.,

*Principal of the Farm Institute, and Assistant Director for
Agricultural Education, Staffordshire County Council.*

THE Staffordshire County Council propose to open the Rodbaston Farm Institute for the reception of pupils early in October. The estate, which comprises 583 acres, was purchased early in the year 1919. A portion, 268 acres, has been utilised for a small-holdings colony, and the remainder has been retained for educational purposes. There are on the farm extensive farm buildings, a bailiff's house, and a large mansion containing upwards of thirty rooms. There is an extensive walled garden which contains large glass houses.

From an historical point of view the estate is of interest. The name "Rodbaston" is of considerable antiquity. It figures in the Domesday Survey, made in the year 1086, as the manor of Redbaldstone, County of Stafford. At that time it was the property of Richard the Forester, otherwise known as Richard the Hunter, and was conferred upon him by favour of William the Conqueror in return for his services as keeper of the then existing and adjacent forest of Kanoe (Cannock). The mound on which the original house was built is still to be seen surrounded by an ancient moat.

The Institute is situated in the Parish of Gailey, eight miles from the county town of Stafford, and an equal distance from the busy manufacturing town of Wolverhampton.

Owing to the need for economy the original scheme has been greatly modified. For the present, temporary dairy accommodation has been provided, and a house for the Principal is in course of erection. Arrangements have been made in the hostel for classrooms and a laboratory. At the farm buildings there are a carpenter's and a blacksmith's shop.

When certain alterations have been made in the house there will be accommodation for the residence of the staff and for twenty-five students.

The course of instruction for male students is intended to extend over two terms, each of eleven weeks, from October to March, and it is proposed to provide a summer course for women students from April to July.

The chief aim of the instruction given will be to prepare young men and women for the daily routine work on the farm

or in the farmhouse. With this object in view the lectures in the classroom will be co-ordinated with the practical work of the farm, and of the dairy and kitchen. Throughout the course a large proportion of the time will be occupied in ordinary practical operations affecting each subject of instruction, and every student must be prepared to take his part in the work. The instruction given at the Institute is specially designed for those who intend to obtain their living from the land. For example, the lectures on "Breeds and management of cattle, horses, sheep and pigs" will be followed by practical instruction in stock-judging, where the score card will be used and the chief points of the various breeds and classes of farm animals will be illustrated. The cultivation and improvement of land, the handling of labour, demonstrations of the use of manures, the results obtained from the use of various feeding stuffs, the increase in the live-weight of cattle, sheep and pigs as shown by the weighbridge, will be practically demonstrated.

In the garden the management of fruit and vegetable crops for home consumption and for market-gardening purposes will be practised. The keeping of poultry and bees will also be taught by the most up-to-date and practical methods.

The fees for the six months' winter course will be as follows :—

Tuition fee for all students	...	...	...	...	...	£5.
Maintenance fee for pupils resident in the Administrative						
County of Stafford	...	...	...	...	...	£25.
Maintenance fee for pupils residing outside the Administrative						
County of Stafford	...	...	...	...	...	£45.
Maintenance fee for day pupils	...	...	...	...	...	£7 10s.

A limited number of Scholarships and Maintenance Grants will be offered to selected students who are resident in the Administrative County.

The most promising students will be encouraged to proceed from the Institute to the Provincial Agricultural College (Harper-Adams Agricultural College, Newport, Salop), or to the University, and those from the Administrative County will be eligible to compete for the Major Agricultural Scholarships.

The course for women students will provide instruction in dairying (including cheese-making and butter-making), poultry- and bee-keeping, fruit and vegetable growing, and domestic science and household management.

In all cases continuity will be the aim of the Institute, which will form a step in the ladder leading from the elementary school to the Agricultural College or to the University.

AGRICULTURAL RESEARCH AS A CAREER.

THE progress of agricultural science has in the past been hampered by the poor material prospects which agricultural research work has offered to the scientific worker. To attract and retain talented workers in this sphere the Ministry has instituted a scheme which affords a definite career to the men and women engaged at the Agricultural Research Institutes in England and Wales. Before proceeding to describe the scheme, however, it may be explained that these institutes are for the most part attached to a university or university college, the notable exception being the Rothamsted Experimental Station at Harpenden, which is at the same time the oldest and one of the largest and most important. Each institute devotes itself to a particular branch of agricultural science, as for example, plant nutrition and plant pathology at Rothamsted, plant breeding and animal nutrition at Cambridge, agricultural economics at Oxford, fruit culture at Long Ashton and East Malling. The members of the scientific staff are recruited principally from young graduates who have taken honours in natural science and who have since specialised in some branch of science with an agricultural bearing, frequently with the aid of a research scholarship granted by the Ministry.

Each institute is independent and self-governing, but certain grades of staff have been established common to all, and it is expected that there will be promotion, not only within institutes, but from one institute to another concerned with similar branches of science. At each institute there is a Director who receives a personal salary; below the grade of Director there are Principal Assistants with a salary of £600 rising by annual increments to £800 a year; Senior Assistants with a salary of £400 rising to £600; Assistants with a salary of £300 rising to £360; and temporary Junior Assistants with salaries varying according to their duties and the cost of living. A bonus, the amount of which is subject to revision from time to time as the cost of living falls, is at present paid to Assistants, Senior Assistants and Principal Assistants. At the moment of writing the bonus is £150 on salaries of £400 and under, and 15 per cent. on amounts over that sum; a reduction will, however, shortly be made in these rates.

The tenure of the posts of Principal and Senior Assistants may be regarded as possessing much the same measure of permanence

as that of a Professor or Reader in a university. The establishment is guaranteed by the Ministry so long as Parliament continues to provide funds, and the occupier of the post may expect to hold it *quam bene*. The tenure of posts of Assistant is, however, not guaranteed, and appointments as Junior Assistant are in all cases temporary. With few exceptions a contributory superannuation scheme is in force at the Research Institutes, and every permanent worker may look forward to a moderate pension on retirement at the age of 60 or 65.

Research workers at Research Institutes are in no sense Civil Servants. The Ministry makes annually a contribution to the funds of each institute, but this is purely a grant-in-aid, so that, although the institute would in all probability be unable to carry on its work, at any rate on the same scale, if the Ministry's contributions were withdrawn, the final responsibility rests upon the university or other governing authority, and the strict liability of the Ministry ceases when its grant is paid. It is in the highest degree unlikely that Parliament would cease to vote money for the prosecution of research in agriculture or that support would cease to be given to Research Institutes: but the adoption of the system of annual grants-in-aid ensures (1) that the institute retains its power of self-government, and (2) that the work and administration of the institute must justify the support for which it asks. This method of control by grant-in-aid without direct administrative responsibility is, of course, a usual feature of the British system of administration. By applying the method to agricultural research it is hoped to combine the minimum of State interference with the most favourable conditions for carrying out research.

While it is theoretically possible to conduct research in a Government Department, it hardly admits of doubt that the atmosphere of the university is more conducive to good work.

“When one considers the nature of research, the slowness and irregularity with which results of visibly economic value accrue, the remoteness of its methods from those of a public department, and particularly the character and personality of the men who distinguish themselves in research, it will be generally agreed that the looser system of control prevailing in a university is the most appropriate. The true investigator is always somewhat anarchical in temperament, his work is apt to be continuously destructive of accepted opinions and established reputations. . . . The type of man wanted for research is more attracted to a university than to a Department. . . .

A second advantage which comes from the association of Research Institutes with the universities lies in the informal co-operation that is thereby ensured with other workers in the field of pure science. . . . Lastly, contact with the business of farming is more readily attained by the association of the Research Institute with a University which is teaching agriculture and dealing with the farmers of its district than with a Government Department.”*

Parallel to the Research Institutes are the Advisory Centres. The Advisory Scheme is designed to place the services of specialists in various branches of agricultural science at the disposal of farmers in each of the “provinces” into which England and Wales have been divided for the purpose of agricultural education. There are advisers in botany and entomology who deal with the fungoid and insect pests which attack plants, in chemistry who deal mainly with soil questions; other advisers will be appointed for animal diseases which are not dealt with in ordinary veterinary practice, and possibly for other subjects. To be able to advise, these men must not only start with specialist knowledge but must be able to investigate the problems arising in the district which they serve. The considerations which have determined the placing of research in the hands of institutions of a university type have decided the Ministry to attach these advisers also to such institutions. The grades, salaries and general conditions of service are the same as those for research workers. The advisers have a somewhat closer bond, however, with the Ministry of Agriculture in that they may be called upon, for example, to take part in organised measures against some particular pest, and they submit to the Ministry periodical reports on plant diseases which are collated with those from other districts and other sources.

A word may be said finally on the Research Scholarships which are awarded by the Ministry, and which may be regarded as an avenue to a career of agricultural research. In the present year the maximum number of scholarships to be awarded is five. The candidates must have taken an honours degree in natural science or must produce other evidence of exceptional qualifications for an advanced course in some branch of agricultural research. The applications are considered by a committee upon which there sit leading men in agricultural science and certain public officials; upon the decision of this committee the awards are made. The scholarships are of the value of £200 a year, and

* Sir D. Hall : Trueman Wood Lecture, Royal Society of Arts, 1921.

the scholars are required to pursue a course (at present of two years' duration) at one or more approved institutions. Quarterly progress reports are submitted to the Ministry. No promise of employment is held out to scholars when their scholarship expires, but it is natural for the Directors of Research Institutes to look for their assistants from among them, providing that they possess the qualifications which are required for a vacant post or a particular piece of work.

The assistance which the Ministry gives does not end with scholarships, for it has been able recently to award, and hopes in future to offer annually, a small number of travelling fellowships to provide the expenses of research workers who desire to visit laboratories and other institutions abroad and to extend their knowledge of methods and technique.

The whole scheme is yet in its infancy, and it is too early to speak of more than the promise of success. To the country it promises a succession of able investigators making agricultural research their life work: to the worker it promises a career free, as far as is reasonably possible, from the distracting cares of an ill-paid profession: to the young graduate it promises a ladder, not to riches, but to the highest rewards of science, the discovery of truth, the advancement of the public good, and the esteem and appreciation, never unduly bestowed, of his fellow-workers.

THE HERDWICK SHEEP.

A. EWING REID, M.C., N.D.A., N.D.D.

THE Herdwick sheep is a breed of sheep little known beyond its native hills—the Fells of Cumberland, Westmorland and North Lancashire. The unique characteristics which eminently fit the breed for the poor high pastures are not those to commend it in the fatter lands and more populous places. The writer has never seen Herdwick sheep nor heard of their existing outside the counties of Cumberland, Westmorland and Lancashire, and in these counties they exist only on the Fells or hills.

The first volume of the Herdwick Sheep Breeders' Association published in 1920 registers flocks of breeding ewes to the number of 13,600, and there are many flocks not in the Herd Book. Though numerically comparing unfavourably with the other and better known breeds of sheep, they are nevertheless of great importance. In the writer's opinion they are the only breed of live stock capable of existing on and exploiting agriculturally that huge stretch of high-lying poor land which constitutes the picturesque mountains of the English Lake District.

The exceptional hardiness of the breed is evidenced by their habitat, some of the runs or heafs reaching more than 3,000 feet above sea level, *e.g.*, Helvellyn, Skiddaw, Saddleback. The sheep possess original characteristics and apparently have no affinity to any other British breed, though it has been suggested that they may have been the progenitors of the Black Faced Sheep. Attempts to cross them with other breeds to improve their wool or weight have without exception failed, their hardiness always being impaired.

The name Herdwick (*Herd*, a number of animals under charge of a man; and *wick*, a district or here a run) signifies a tract of land under charge of a herd or shepherd employed by the owner or Lord of the Manor.

The following extract is from a charter of lands at Furness Abbey, dated 1537, and brings out the meaning of the word Herdwick: "Pastures and Agistament and brusying occupied to those of the said late Monastery for the sustentacyon of the catell and . . . devyded into sundry herd wycks and shepe cots" Also, referring to lands in same district in 1564: "Those parcellls following, that is to say the Herdwick called Waterside Parke—the Herdwick called Lawson Parke, &c."

The name of the breed is derived therefore from the peculiar custom associated with feudal grazing rights and still seen in

the unique type of farm "let"—the general rule even to this day) and not from any place name or physical peculiarity of the sheep as with most other breeds.

Origin.—The origin of the breed is obscure. Local legend credits its origin to 40 small sheep washed ashore from a Spanish ship wrecked on the Cumberland coast at the time of the Armada, and which, becoming the property of the Lord of the Manor and being found to suit the high bare lands in the neighbourhood, were apportioned to local farmers. The mode of farm "let" still commonest, viz., that of a flock of sheep "the heaf going flock" being let along with the land lends some support to this legend. Careful investigation, however, reveals the fact that a Spanish breed resembling Herdwicks in any character, did not then exist, and it is more likely that the breed is of Scandinavian origin, where hardiness would be a characteristic. The Herdwick country is rich in evidence of Norse occupation, "garths" and "holms" and "bys" predominating as place names. The theory of the Scandinavian origin is further substantiated by a method of scoring used among Herdwick men within the memory of man. The numbers used varied locally, but the following appears to have been the commonest:—

1. Yen.	6. Haata.	11. Yan a dick.	16. Yan a Mimph.
2. Taen.	7. Slaata.	12. Taen a dick.	17. Taen a Mimph.
3. Tedderte.	8. Loura.	13. Tedder a dick.	18. Tedder a Mimph.
4. Meddert.	9. Dowra.	14. Medder a dick.	19. Medder a Mimph.
5. Pimp.	10. Dick.	15. Mimph.	20. Gigget.

Description.—The Herdwick looks what it is, a hardy mountain sheep. The activity required to make a living on the snow-covered Fells, and a coat to withstand the rigours of those high altitudes in winter, indicates a smallish, active, rough-coated sheep. A touch of the demerits of its ancient lineage and a suggestion of the primitive are discernible.

The characteristics of a good Herdwick are a coat of long, well-knit broad wool grown well out at the extremities, standing up round the neck in a good mane, and covering the top of the head. The head should be carried high—the nose arched, and the eyes prominent and well developed. The face should be grey or rimy (hoar frost appearance). Spotted legs and faces are inadmissible, but dark coloured sheep generally show best constitution. The lambs are born a good black and white, the head, legs and neck being black, the rest of the body white. As they grow older the dark colour changes to a light grey. The ears are white, sharp and active. The body is round and deep, the chest wide and prominent. The legs are short from knee to



Photo]

[Mayson, Keswick.

Herdwick Ram King Dick : Owner, F. R. Searle, Lonscale, Threlkeld.



Photo]

[Mayson, Keswick.

Herdwick Ewes on Skiddaw Fell.



Photo]

Herdwick Ewes and Lambs on typical Fell.

[Majson, Kestrick.

fetlock and covered with strong bristly hair, and the feet are wide and white. Especially in one flock the presence of an extra or 14th rib is often found.

The rams are generally horned; of 570 examined, only $4\frac{1}{2}$ per cent. were hornless, and some of these latter had rudimentary horns. The ewes are always hornless.

The Fells, the habitat of this breed, are high up, 3,000 feet or more, steep, hard, dry, and poor grazing. On these Fells perhaps no other breed of British live stock could exist, yet except when the snow is too deep or is frozen for a lengthy period the Herdwicks receive no hand feeding. The winter death rate is high, but only the existence of such a breed allows those poor heights to be exploited. Bracken covers the Fells, and maggots are a serious summer cause of wastage.

A Typical Tenancy.—Some of the Fells have recently been fenced, but generally the Herdwick farm is unfenced, the grazing rights being described in the lease as “unlimited Fell.” This fact dictates, though the Feudal system may have had its influence, the unique custom, still the general rule, that a regular breeding flock of sheep, the “heaf (heath) going flock” is let along with the land. The flock, like the land, is the property of the landlord. The tenant finds security for redelivery of this flock at the end of the tenancy. The let stipulates that “the heaf going must be maintained,” and a like number of sheep of condition, quality, age and sex be handed over to the incoming tenant. Oversmen act for both parties at the turnover, and the landlord may pay for “betterment” or the tenant for “worsement.”

A typical heaf going flock would consist of the following sheep, as in a place which was advertised last year:—

200 Wethers: 80 4-year-old, 120 3-year-old.

300 Ewes.

250 Hogs, half male, half female.

150 Twinters, *i.e.*, two winters, half male, half female.

3 Rams.

Total 903 Sheep.

Heaf going flocks vary from 50 to 2,000 sheep. The 69 flocks registered last year in the Herdwick Sheep Breeders' Association Flock Book shows an average ewe stock of 169 ewes. These represent the hill farms, but many much smaller flocks are kept as part of the smaller stock raising hillside farms.

Especially on the fenced places the custom is growing of keeping all “gimmer,” *i.e.*, female hogs.

On these unfenced Fells, it is only by keeping sheep reared on the place that straying can be prevented, and the full resources of the Fell can be exploited. The older sheep lead the others well out towards the boundaries. For these reasons wethers are kept to the age of four or five years, a custom now considered elsewhere unsound economically.

The fact that these flocks can be maintained on unfenced lands is entirely due to the quite exceptional homing instinct of the Herdwick sheep. A Herdwick born on a particular place will spend the rest of its life within a few hundred yards of that place, and a shepherd knows where he will always find particular sheep. Herdwicks sold away from their native heafs will return from incredible distances, crossing rivers and even lakes en route. To-day they are brought from 3 to 7 miles for dipping, &c., through the flocks of several owners. On being released, if unrestrained, they return to their own heafs.

The rams are put out on the Fells from Martinmas to the end of November. In the higher places they are "ruddled," *i.e.*, coloured all over with red so that they may be easily seen by the ewes on the open Fells during snow. At the autumn shows at Eskdale and Keswick, the rams are generally shown "ruddled."

The peculiar custom of "Ram Letting" is general, and at Keswick on the first Saturday in October and at Eskdale on the last Friday in September large numbers of rams and ram lambs are exposed for sale or hire. The writer knows one farmer who at present keeps seventy stock rams. Many of the best rams are bespoke for years in advance. The hiring fee varies from 30s. to £5 or more—one famous ram was let for seven days at £1 a day, and another for 10 days for £7. Ram lambs are let out to farmers to winter—the farmer wintering them, then having the option of claiming their use for two or more years free of charge.

In the cold spring weather after the season, the rams are kept inside, hand fed and turned out to water, and some of the smaller flocks are housed this way in winter and hand fed. Up to £50 has been paid in the open market for a Herdwick ram.

The lambs are dropped not before the end of April; 90 lambs to 100 ewes is good, 80 to 100 not bad; 10 per cent. of ewes with twins is quite good.

It is essential that the lambs be wintered on low land the first year. The usual Herdwick farm not having sufficient low land for this nor to grow hay to hand feed them, wintering "outside" must be found. Owing to the difficulty of finding this near, to the high cost of freighting if carried to a distance, and

to the high charge for wintering (now 12s. 6d. a head from 10th October to Ladyday) this unfortunately essential charge is a very serious drain on the hill farmer.

As the majority of the farms are unfenced it is especially necessary that the sheep of each flock can be easily identified. Each flock therefore has its characteristic ear and body marks. These are registered in the *Shepherds' Guide*, where engravings of both sides of the sheep of each flock are given, showing the position and description of the various marks. Marks have become part and parcel of certain places, remaining with them through any changes of tenancy, *e.g.*, just a raven clapped on the near side will always mean Ravenscrag farm. Flock-masters were wont to meet annually at Kerkstone Top (2,000 ft.) to exchange strays, but this is now done mostly at the various sheep fairs and ram hirings.

The best ewes are generally kept for the production of pure bred lambs, but on those places where any low land is available a proportion of ewes will be crossed with Leicester or Wensleydale rams for producing grey-faced lambs. The former give the quicker-growing lambs, the latter the longer-backed selling sorts. These grey-faced lambs are sold to the lowland farmers who fatten them off or keep them as breeding stock.

The average weight of the dressed Herdwick carcass is about 12 lb. per quarter for adults. The mutton is unexcelled by that of any British breed of sheep, and 4-year-old Herdwick mutton is claimed to be the best finished and most valuable mutton produced. Four-year-old Herdwick wethers sold last year at prices ranging to over £5 each.

The average ewe fleece weighs about 4½ lb., but rams and ewes fed for shows often yield twice that weight. The wool is coarse, and was used for carpet making, but at present, like the wool of other breeds, it is a drug on the market. In 1908 the price fell as low as 4d. per lb.

Among these mountains innovations come slowly and many ancient and interesting customs still survive. The *Shepherds' Meets*, at which formerly "strays" were handed over, partake now more of the holiday, and at the Dun Cow at Mardale (soon to be 20 feet below the surface of Lake Haweswater) there is annually a great meeting of shepherds; the day is given over to fox hunts, hound trails and Fell races, the evening to song and sentiment, where yet one may hear many a lusty hunting song and many a strange toast—such as "Confusion to the scab," and "Full sheets and ready money."

SILAGE FOR DAIRY COWS.

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and

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IN the eastern parts of Essex, Suffolk and Norfolk considerable difficulty is experienced in growing satisfactory crops of mangolds owing to the dry climatic conditions prevailing during the summer months, and in the case of Essex these unfavourable circumstances are accentuated by the very heavy nature of the London clay soils.

It is because of these difficulties that many farmers have been turning their attention to silage as a substitute for roots.

In an average season silage cannot be grown at the same cost per ton as roots, and it is probable that unless it can perform other feeding functions than replace an equal weight of mangolds it is not likely to prove an economical substitute for roots in the feeding of dairy cows.

In an article in an earlier issue of this *Journal* (Vol. 23, June, 1916, p. 224) Oldershaw gave an account of some trials he made to ascertain whether a ration of 60 lb. of silage could replace 60 lb. of mangolds and 7 lb. of straw chaff in the feeding of dairy cows. The silage used consisted of tares and oats in the proportion of 1 of oats to 2 of tares, and the results showed that for milk production the silage ration was slightly superior; the difference, however, was so small as to be within the limits of experimental error.

An examination of the rations shows, however, that the silage ration contained considerably more albuminoids than the mangold ration, and it would therefore seem that use could be made of this fact to reduce considerably the amount of concentrates fed.

In the autumn of last year it was decided to carry out an experiment on the farm of Messrs. F. B. & F. J. Pitcher, Burnham-on-Crouch, the object being to ascertain whether silage could effectively take the place of mangolds weight for weight and at the same time effect an economy in the use of cakes and meals.

Messrs. Pitchers' holding at Mangapp, Burnham, consists of 165 acres of arable land and 181 acres of grass (50 acres of this

being marsh land). The soil is a heavy London clay, and as the farm is situated in the driest area in Great Britain (average rainfall 19.28 inches) a very real difficulty is experienced in securing satisfactory crops of mangolds.

The advantages of ensilage under such conditions are numerous, but it will suffice to mention the more important ones.

In the first place an ensilage crop is sown in the autumn, and, provided the proper tilth is obtained and the mixture selected is a suitable one, the crop is not likely to fail. In the rare event of a failure it is possible to resow in the spring. The crop, moreover, is carted off the land in the dry weather and the land can be well cleaned and prepared for autumn wheat. Mangolds, on the other hand, are sown in the spring, and early spring and late winter are bad times to work heavy London clay soils. Furthermore, the period May to July, when the young mangold plant most needs rain, is the driest period of the year and drought frequently ruins the crop. Mangolds are often carted off at a time when the land is wet, and unless the autumn is particularly favourable it is impossible to prepare the land for an autumn crop. Consequently mangolds are frequently followed by a spring corn crop, and spring oats in particular are seldom successful in Essex, for unless they can be sown in February they are almost invariably badly "bottled."

A crop for ensilage requires a great deal less labour than for mangolds, both in cultural operations and in its subsequent management. Mangolds, for example, have to be carted from the clamp, cleaned, pulped and mixed with the chaff before feeding. The silo on the other hand was arranged so that the silage can be thrown down the shoot on to the barn floor from which it is fed to the cows.

Mangolds are gross feeders and unless heavy dressings of artificials and farmyard manure are applied they make a big drain on the fertility of the soil. If a suitable mixture of cereal and leguminous seeds are grown for ensilage the demands on the soil are considerably reduced and the store of nitrogen in the soil may even in some cases be increased.

Silage, particularly when the mixture consists of a considerable proportion of leguminous seeds, is much richer in albuminoids than mangolds, and Messrs. Pitcher were anxious to find out whether by using silage it would be possible for them to reduce the amount of purchased feeding stuffs in use. It was to obtain information on this point that the experiment was carried out.

The Silage Crop.—The crop grown for ensilage consisted of a mixture of tares, oats and beans, in the proportion of 3 bushels of tares, $\frac{1}{2}$ bushel of oats, and $\frac{1}{2}$ bushel of beans per acre. The mixture was not a very suitable one as there were not enough beans and oats to hold up the tares. Consequently the crop was difficult to harvest and a rather large proportion was left in the field. (This year the proportion of beans and oats has been increased and better results are looked for.)

Approximately 5 tons per acre of silage were taken from the silo, which was of the wooden stave pattern. An analysis of the silage gave the following percentage results* :—

Moisture	...	...	...	...	...	70.84
Oil	...	...	...	...	...	1.43
Crude albuminoids	...	...	...	...	...	4.86
Carbohydrates	...	...	...	...	...	10.46
Fibre	...	...	...	...	...	9.32
Ash	...	...	...	...	...	3.09
						<hr/> 100.00 <hr/>

A herd of 30 dairy cows is kept on the farm. For the purpose of the experiment eleven cows were selected and divided into two lots—Lot A consisting of six cows and Lot B of five cows. The average number of days since calving to December 6th, when the experiment began, were for Lot A 91 days and for Lot B 81 days.

Experimental Rations and their Feeding Value.—The following experimental rations were drawn up :—

<i>Mangold Ration.</i>	<i>Silage Ration.</i>
50 lb. Mangolds.	50 lb. Silage.
10 lb. Meadow hay.	10 lb. Hay.
18 lb. Oat straw chaff.	4 lb. Dried ale grains.
4 lb. Dried ale grains.	3 lb. Concentrates.
5 lb. Concentrates.	

The concentrates consisted of a mixture of decorticated cotton cake and bean meal in the proportion of 3 to 2.

The rations contained the following amounts of dry matter and digestible constituents (lb.) :—

	<i>Digestible Constituents.</i>			<i>Carbo- hydrates & Fibre.</i>	<i>Production Starch equiv.</i>
	<i>Dry. Matter.</i>	<i>Protein.</i>	<i>Fat.</i>		
Mangold Ration	38.5	2.50	.77	18.6	15.5
Silage Ration	29.9	2.46	.89	12.7	13.5

The mangold ration as set out is the ration normally fed,

* We are indebted to Mr. F. Knowles, of the Institute of Agriculture, for these figures.

and it was thought undesirable to modify it. It will be noted that it contains considerably more dry matter and a higher starch equivalent than the silage ration, a difference accounted for by the somewhat large quantity of oat straw chaff included. Messrs. Pitcher were anxious to ascertain whether by using silage they could dispense with the oat straw altogether. Had the amount fed in the mangold ration been reduced to 8 or 10 lb. both rations would have contained approximately the same starch equivalent and digestible carbohydrates.

Times of Feeding, &c.—

- 5.30 a.m. Dried grains fed.
 7 a.m. Cows watered.
 7.30 a.m. Half silage (25 lb.) to silage-fed cows.
 Half mangolds and chaff to mangold-fed cows.
 10 a.m. Concentrates given.
 2 p.m. Other half of silage or mangolds and chaff.
 4.30 p.m. Watered.
 5 p.m. Hay.

The hay was weighed several times throughout the course of the experiments, and averaged 10 lb. per head per day.

Experimental Results.—The experiment commenced on December 6th, and the arrangements for the two lots were as follows :—

<i>6th Dec. to 2nd Jan. (incl.)</i>	<i>3rd Jan. to 30th Jan. (incl.)</i>
Lot A. Mangold Ration.	Lot A. Silage Ration.
Lot B. Silage Ration.	Lot B. Mangold Ration.

Lot A thus received the mangold ration for 28 days and Lot B the corresponding silage ration. On 3rd January the rations were changed over, Lot A receiving the silage ration for 28 days and Lot B the mangold ration for the same period. The cows were milked twice daily, and the milk from each cow was weighed at every milking. The results are set out in Table 1.

TABLE 1.
MANGOLD RATION.

<i>Lot A. 6th Dec.—2nd Jan. (incl.)</i>			<i>Lot B. 3rd—30th Jan. (incl.)</i>		
<i>lb. of milk</i>			<i>lb. of milk</i>		
<i>Name of Cow.</i>	<i>during the period</i>		<i>Name of Cow.</i>	<i>during the period</i>	
	<i>(28 days).</i>			<i>(28 days).</i>	
Wringle ...	... 1,203·0		Duchess 2nd ...	... 617·5	
Poley ...	... 819·0		Smutt 2nd ...	... 793·0	
Spot ...	... 552·5		Curly ...	... 1,417·5	
Frost 3rd ...	... 537·5		Ada ...	... 962·0	
Darlington ...	... 901·0		Daisy ...	... 375·0	
Beauty ...	... 552·0				
Total Milk ...	4,565·0 lb.		Total Milk ...	4,165·0 lb.	
<i>Total Milk from Mangolds ...</i>			<i>... 8,730·0 lb.</i>		

SILAGE RATION.

<i>Lot A.</i> 3rd—30th Jan. (incl.)			<i>Lot B.</i> 6th Dec. to 2nd Jan. (incl.)		
Wringle ...	...	1,269·5	Duchess 2nd ...	...	616·5
Poley ...	...	894·5	Smutt 2nd ...	...	803·0
Spot ...	...	488·5	Curly ...	...	1,275·5
Frost 3rd ...	...	474·5	Ada ...	...	1,029·0
Darlington ...	...	1,011·5	Daisy ...	...	398·5
Beauty ...	...	612·0			
Total Milk ...	...	4,750·5 lb.	Total Milk ...	...	4,122·5 lb.
<i>Total Milk from Silage ...</i>			<i>... 8,873·0 lb.</i>		

There is a gain of 143 lb. of milk over a period of 28 days in favour of the silage ration, a small increase it is true, but probably a real one. Lot A undoubtedly did considerably better on the silage than on the mangold ration. Inspection of Table 1 shows that when the silage ration started on 3rd January all the cows save Spot and Frost increased their milk yield. Spot and Frost had both been calved for over four months and a big falling off in the milk yield was inevitable. Wringle and Poley had been calved 78 days and 86 days, respectively, when the mangold ration ceased and the silage ration began, and in the subsequent 28 days the milk yield of both cows increased considerably instead of declining gradually as would normally be expected.

Lot B receiving silage from 6th December to 2nd January was changed over to mangolds on 3rd January. During the subsequent 28 days the milk yield of three of the cows declined slightly, as would normally be expected. One other remained stationary, whilst the fifth showed a considerable increase as the result of a change to mangolds. The evidence, therefore, seems to indicate stimulating influence by silage on the secretion of milk.

No difficulty whatever was experienced in feeding the silage to the cows, and it soon became evident that they preferred it to mangolds. When the cows came back to their stalls after being turned out, those fed on the mangold ration habitually made for the stalls of the cows receiving the silage ration and licked out the mangers. Moreover, every morning when the cows were turned out they made straight for the sump at the foot of the silo, and there was vigorous competition for the silage juice despite the fact that it had rather an objectionable smell—somewhat resembling that of a tannery.

The change from mangolds to silage and *vice versa* had no adverse effect on the milk yield, and a close inspection of the

daily yields at the changing dates gives no indication that any change in the feeding had taken place.

Effect of Silage on the Quality of the Milk.—Unfortunately it was not possible to take samples of milk from each cow daily, so that no detailed information concerning the effect of silage on the quality of the milk was procured. A few days after the experiment began samples of milk were taken morning and evening and analysed from all the cows taking part in the trial, and again on 12th January, nine days after the rations were changed over, samples were again taken and analysed. The results may be conveniently summarised as follows:—

<i>Lot A.</i>				Fat.
				Per Cent.
Average quality of Milk from	Mangold Ration	...		3.56
" "	" " Silage Ration	...		3.50
<i>Lot B.</i>				
Average quality of Milk from	Silage Ration	...		4.60
" "	" " Mangold Ration	...		3.96
Average percentage of fat in milk produced from	Mangold Ration	...		3.74
" "	" " Silage Ration	...		4.00

Little importance can be attached to the apparent improvement in the quality of the milk from silage, since it was entirely due to a fall in the quality of the milk from Lot B when changed from the silage ration to the mangold ration. The quality of the milk from Lot A was practically the same on both rations. While it is impossible to lay any stress on the figures suggesting an improvement, the result shows there is no reason to anticipate any adverse effect on the quality of the milk by substituting silage for mangolds.

In the United States some of the milk-condensing factories have refused to accept milk from dairies where silage is fed, but this action is by no means general, and the rapidly extending use of silage is evidence that the prejudice against it is steadily being overcome. It is difficult to ascertain the specific reason for such objection, although it is maintained that experts can detect an odour of silage in milk from silage-fed cows. In the experiment in question no such noticeable odour or flavour was associated with the milk, and no complaints were made by the consumers. If milk is reasonably handled and properly cooled no objection should be experienced. If on the other hand milk is left uncooled in an atmosphere smelling strongly of silage it will quickly pick up the flavour of the material—a remark which applies in connection with the use of several other feeding stuffs.

The Relative Cost of the Mangold and Silage Ration.—The question which naturally arises from consideration of the above experiment is: "Has silage proved an economical substitute for mangolds?" As this was one of the points upon which information was sought a detailed account of the cost of growing and feeding the mangold and silage crop was kept, and from this record the following summary has been prepared:—

<i>Cost of Mangolds per Ton.</i>					£	s.	d.
Cost of growing and clamping mangolds per acre	...	...	...	...	24	0	0
Cost of carting mangolds from clamp and pulping	...	...	...	...	2	16	0
Total cost per acre					£26	16	0
Yield of mangolds per acre	...	...	...	...	15 tons		
Cost of mangolds per ton	...	...	...	...	1	15	9
<i>Cost of Silage per Ton.</i>					£	s.	d.
Cost of growing silage crop and filling silo per acre	...	...	...	...	10	0	0
Yield of silage per acre	...	...	...	...	5 tons		
Cost of silage per ton	...	...	...	...	2	0	0

If the purchased feeding stuffs, hay and straw, are taken at market prices the cost of the two rations works out as follows:—

lb.	<i>Mangold Ration.</i>				d.
50 Mangolds at £1 15s. 9d. per ton	9·5
10 Meadow hay at £6 per ton	6·4
18 Oat straw chaff at £3 10s. per ton	6·7
4 Dried ale grains at £11 10s. per ton	4·75
5 Concentrates at £19 16s. per ton	10·60
Total cost of food per cow per day					37·97d.
Average yield of milk per cow per day					28·3 lb.
Cost of ration per gal. of milk					13·4 d.
lb.	<i>Silage Ration.</i>				d.
50 Silage at £2 per ton	10·9
10 Meadow hay at £6 per ton	6·4
4 Dried ale grains at £11 10s. per ton	4·75
3 Concentrates at £19 16s. per ton	6·36
Total cost of food per cow per day					28·41d.
Average yield of milk per cow per day					28·8 lb.
Cost of ration per gal. of milk					9·9 d.

The results are shown graphically in Fig. 1. In spite of the somewhat greater cost of silage, the silage ration has proved to be much more economical than the mangold ration, in large measure owing to the saving on the cake bill.

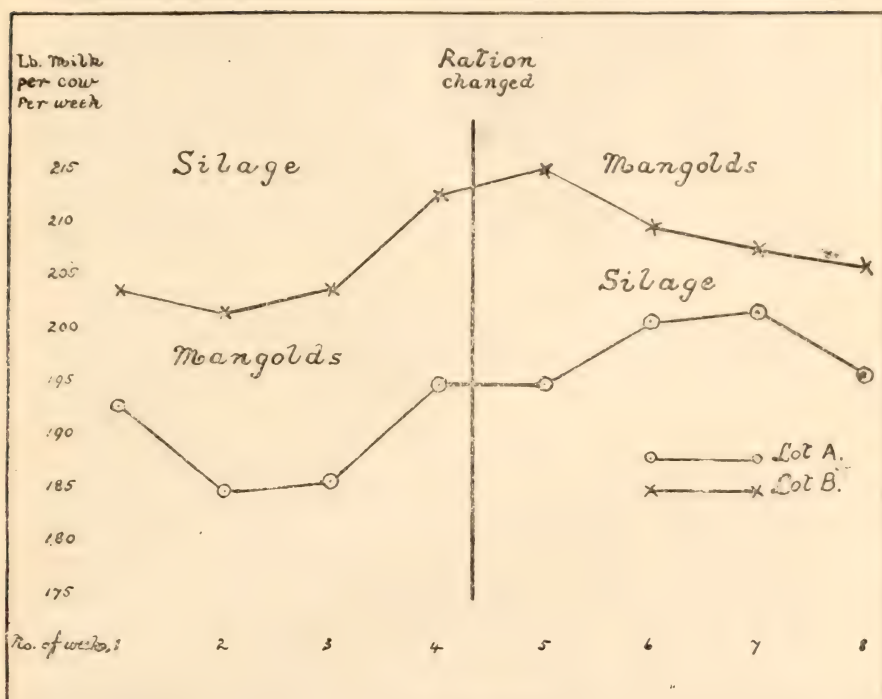


FIG. 1.

Total Yield
of Milk.Cost of Feeding
per Cow per day.Cost of Feeding
per gal. of Milk.

FIG. 2.

The Saving on the Cake Bill.—It will be noted that 50 lb. of silage has taken the place of 50 lb. of mangolds, 18 lb. of oat straw chaff and 2 lb. of concentrates. A saving of 2 lb. of concentrates per head per day in a herd of 30 cows is a considerable advantage. If we assume that the herd is receiving winter rations from 15th October to the 15th April, a total of 182 days, the saving works out as follows :—

	£	s.	d.
Decorticated Cotton Cake, 2 tons 18 cwt. at £18 per ton	52	14	0
Bean Meal, 1 ton 19 cwt. at £16 10s. per ton ...	32	3	0
Total Saving ...	£84	17	0
Saving per Cow ...	£2	16	6

To the above figure must be added the saving on oat straw. Approximately 44 tons of oat straw would be saved during the six months by a herd of 30 cows receiving 18 lb. per head per day. At £3 10s. per ton such straw has a value of £154.

As to whether it would be desirable to dispense with the use of oat straw chaff depends upon the possibility of putting it to an equally useful purpose on the farm or obtaining a profitable market for it. In any case, if the oat straw chaff remained in the ration it would clearly be necessary to curtail the hay considerably.

In the case in question the total savings in the use of other feeding stuffs stand as follows (assuming that a herd of 30 cows received the silage ration during the whole of the winter period) :—

Saving in purchased feeding stuffs ...	value	£84	17	0
„ oat straw ...	„	154	0	0
Total ...		£238	17	0
Less extra cost of silage		31	17	0
		£207	0	0

It will be noted that such a favourable economic result from the use of silage is to a large extent due to the fact that the low yield of mangolds per acre is responsible for the high cost per ton. Under the climatic conditions of the east of Essex it is but seldom that the present yield of 15 tons per acre is exceeded to any considerable extent. In interpreting the results such a condition of affairs must be borne in mind. It costs no more to grow and manure a 40-ton crop of mangolds than a 15-ton crop, and where a 30-ton crop of mangolds can be grown with

reasonable certainty the substitution of silage may not be so profitable. Although the cost of feeding stuffs, purchased and home-grown, has fallen considerably since these estimates were drawn up, the fall in prices does not affect the relative economic position of the two rations.

Conclusions.—In the experiment under consideration silage has proved a very efficient substitute for mangolds for dairy cows.

The quality, quantity, and flavour of the milk were not in the least impaired by the use of silage; the evidence available rather tends to show a slight improvement in the yield of the milk.

The silage ration has undoubtedly proved to be more economical than the mangold ration, the cost being 9.9d. per gallon of milk compared with 13.4d. in the case of the mangold ration.

By the use of silage it has been possible to reduce the consumption of purchased feeding stuffs to a very considerable extent. A saving at the rate of £2 16s. 6d. per head in the cost of purchased feeding stuffs for winter feeding (six months) was effected. In addition a very considerable saving in oat straw or hay can be secured.

The season of 1920 was favourable to the mangold crop in Essex, and it seems fair to conclude that for an average season the general economic result would be more markedly in favour of silage. During a dry season, like the present one, a silage crop is able to conserve the soil moisture by covering the ground early in the spring, and a satisfactory crop results. In the case of mangolds the condition of the soil at the time of sowing, the subsequent spell of dry weather, and the fact that the crop does not protect the soil from the direct rays of the sun for many weeks, seriously militates against the growth of a satisfactory crop.

THE SOUTH-EASTERN AGRICULTURAL COLLEGE, WYE.

M. J. R. DUNSTAN, *Principal*.

WYE College has a history long previous to its period of use as an Agricultural College, which only dates from 1894. Founded in 1447 by Cardinal Kempe, Archbishop of London and Canterbury, it served as an institution for the training of twelve priests, and its records as to the ordering of the lives and studies of these men have great interest. When we consider the relations monastic institutions of that age had with agriculture, the translation of a monastic educational college into an agricultural education college is not a great diversion of character.

After the dissolution of the monasteries by Henry VIII, the College passed through several educational vicissitudes, becoming finally partly an elementary school and partly a grammar school. The funds available for keeping the buildings in adequate repair for the carrying on of the elementary school, after the grammar school had given up, proved insufficient for the requirements of our modern state department of education. The Charity Commissioners agreed with Lord Winchelsea (who, in conjunction with the County Councils of Kent and Surrey, was then engaged in establishing an agricultural college) to transfer the College buildings and garden to a body of Governors of the proposed agricultural college for the sum of £1,000, which would be expended in building a new school for elementary education. The South-Eastern Agricultural College was then established under a scheme of the Charity Commissioners, and the first Chairman of the Governors was Mr. E. J. Halsey, Chairman of the Surrey County Council. The first Principal was Mr. (now Sir) A. D. Hall, and the staff included Professor Percival (now of University College, Reading), Mr. Theobald (still at the College), and Mr. F. B. Smith (now at Cambridge). To these gentlemen, but especially to Mr. Halsey and Sir A. D. Hall, is due the credit of establishing a college for the teaching of agriculture on sound and progressive lines, and despite keen opposition from a section of the farming community which was opposed to so-called theoretical teaching of farming, the College continued to progress. Starting with 13 students in 1894, the College now has on its books the names of 205 students in residence. Old students of the College are to be found in responsible and successful positions not only in England but all over the world, and the demand for men trained at Wye is an evidence of the careful and far-

seeing way in which the curriculum and intentions of the College were framed.

The buildings have undergone material alteration and addition, but the original quadrangle containing the Principal's house, Library and Refectory has been faithfully preserved, and such a nucleus of reverend buildings has not a little influence on the general tone of the students.

The present College consists of buildings grouped round five quadrangles, and includes teaching, research and administrative quarters. The upper storey is devoted to students' rooms, each man having a bed-sitting room; 70 of these rooms are available in the College. The kitchens and domestic quarters are in a separate block, but in the original design of the College the mistake was made of not providing room for expansion of these departments.

The aim of the College is not merely to teach practical farming. Everyone with even a small knowledge of agriculture must realise that the routine and organisation of farm work, with its frequent variations according to changing weather conditions and other factors which influence its successful management, can only be thoroughly learnt by undisturbed hard work and experience on a farm. What the College can and does give is instruction in those subjects bearing upon farming which can guide a man in the organisation of the resources at his command and help him to make the best use of his capital, labour, stock and land. The student is aided by seeing the practical working and management of the College farm. There is no doubt that a man will make a better farmer if to the qualities of business administration and thorough practical experience there is added a knowledge of principles and of the reasons underlying and prompting sound and progressive practice—a knowledge which will enable him to vary his methods according to the changing demands of markets, climate and soils.

The College courses are three in number. (1) There is the Agricultural Diploma course extending over three years; this can be shortened to a Certificate Course of two years in the case of students who require more practical and less scientific instruction. (2) The Horticultural Diploma Course covers two years. (3) The Degree Course (B.Sc. Agri., University of London) extends over three years. The conditions for the granting of a degree by the University are not yet entirely satisfactory, and negotiations are proceeding in the direction of changes which should make the qualification of higher value.

It is essential that the agricultural student learning about the composition and uses of manures and feeding stuffs, plant growth,

fungus diseases, etc., should have some elementary knowledge of chemistry and of botanical principles, so that he can feel he is dealing with things of which he has a knowledge and may intelligently apply himself to the solution of difficulties which may occur to him in carrying on his industry of farming. The proper place for the elementary sciences to be taught is the secondary school, but until that desirable result is secured the agricultural colleges must include such subjects in their curriculum, and the method of teaching must proceed *pari passu* if possible with the teaching of agriculture, so that the student's knowledge of chemistry or botany becomes part of his agricultural knowledge.

This, however, is a digression from the work of Wye College, which is endeavouring to put this idea of teaching into practical shape in lectures and laboratory work.

Part of the instruction at the College is given by means of practical classes on the farm, *e.g.*, with implements, veterinary demonstrations, &c. If these classes are to be efficient they must be small, and to secure small classes it is necessary either to increase the number of classes or to employ a large staff. A practical demonstration attended by more than 12 or 13 students may be a waste of time except for those who can get near the demonstrator. Students are taught the manual operations (ploughing, work with horses, thatching, etc.), but the intention is not to make skilled workers of them—that can only be done by long experience—but to indicate to them the methods, what is meant by good work, time taken, and so forth.

There is a demand for practical teaching of agriculture from the farming community, but what the advocates of such teaching mean is not always quite clear, though as a rule it is probably what they think is *not* taught at agricultural colleges! A student who is going to be a successful farmer must “go through the mill” of routine farm work, and he must supplement his knowledge of stock, crops, soils and manual operations by practical experience relative to the management of men, markets, and financial dealings. Success in farming, as in every other industry, depends upon keen business methods, and a sound knowledge of accounting is not the least necessary qualification.

The system of going as a pupil on a farm is often a very unsatisfactory method of learning farming—the pupil pays a premium and often thinks that therefore he can do as he likes; the farmer may be unskilled as a teacher and permit the pupil to go as he pleases, not initiating him into such important matters as

the business organisation of the production on the farm, the costs of production, the system of keeping accounts and the yearly financial results of the farming. The pupil is often used as cheap labour and is kept at unskilled work too long, gaining no sense of proportion of the value of the different branches of the industry. There are, of course, many exceptions to such an unsatisfactory state of affairs as has been described, but the number of farmers who can and will instruct pupils in the details of their business is very small.

The farmer of the future must have a wider outlook than he of the past. He must combine with his other knowledge some information as to the history of his industry, of the conditions under which his foreign competitors work, of the world markets, of some of the more important economic laws affecting his industry, of recent progress in plant breeding, plant pathology, and engineering, of co-operation, and generally of his position, not as an isolated producer, but as one of an army of producers of goods to supply human wants. He must regard his industry in its relations to other industries, socially, politically, and economically. The agricultural college must therefore stimulate its students in those directions and aid them to become well-informed, broad-minded captains of industry.

The farms at Wye consist of about 450 acres, 390 of which are devoted to agriculture, the remainder being given up to fruit, hops, poultry, market gardening and forestry.

The College farm is always a subject on which the practical farmer loves to discourse, and he points the finger of scorn if it does not pay. The farm is to the agricultural teaching of a college what the laboratory is to the lecture room, a place where demonstration and experiment is carried on to supplement the oral teaching. Its utility lies in its demonstrating different methods (not only those of the locality) of cropping, manuring and management, and its object should be to impress on the student that there are different methods of attaining the same end, and that he must use his intelligence and observation in ascertaining the method most suited to the conditions under which he may be placed. The learner believes and remembers better what he has seen than what he has been told, and it may be necessary to demonstrate bad practice and unsatisfactory methods in order to warn him for his future that commercial and financial success cannot be obtained under such conditions.

An experiment has been made during the past year at Wye College in putting the farm entirely under the charge of a Committee of practical farmers, but it is doubtful whether this

arrangement will prove wholly satisfactory either from the educational or the commercial standpoint.

During the War, in which Wye College lost 13 of its members, a Women's Course was carried on, but it has now closed its doors to women. The demand for women's instruction in agriculture and the allied industries, however, remains, and is unsatisfied owing to the absence of any women's college in England.

The increasing demand from Egypt, India, Argentina and other countries for students to enter English agricultural colleges cannot be satisfied until the arrears of our own students have been cleared off. At present the pressure from English students on the space of Wye, as on that of other colleges, shows little sign of diminishing, but those who wish to take up an agricultural career must be warned that only men with exceptional qualifications can hope to secure appointments, and only those with an adequate supply of capital, well trained and experienced and with business acumen can hope to succeed as agriculturists.

Farming is not, as it was once defined, a career for the man who was not stupid enough for the army and too clever for the Church: it demands a wide knowledge of farming conditions not only in this country but in the countries of our competitors.

The Advisory and Research Departments of Wye are in process of development, and their existence should exercise an excellent influence on the educational side. Owing to the character of farming in the district, questions affecting fruit and hops are of main importance.

The Malling Fruit Station which was started by the College is now an independent unit, but a close connection is maintained with the College, and horticultural students are periodically taken to the station to gain a knowledge of the investigation work carried on there. Short courses in agriculture during the winter months, and in rural science for schoolmasters during the summer, are carried on, but the former courses are of a temporary character, being intended to lapse when the Farm Institute is established at Tunstall.

The policy of the College is to give instruction to the future cultivator by means of the certificate and diploma courses in agriculture and horticulture, to train the scientific expert in the degree course, and to offer opportunities to post graduate students for specialising in investigation work. By a wise expenditure of funds the Governors have equipped the College in a very thorough manner, and their policy would appear to be justified by the reputation of the College and of its students.

BASIC SLAG PROBLEMS.

THE supersession in the steel industry of the basic Bessemer process by the basic open hearth process, with consequent change in the character of the basic slag produced, has created important problems regarding the use of basic slag in agriculture. In place of the old high-grade slag containing 40 per cent. to 45 per cent. of phosphates, agriculturists now usually obtain slag containing only about 20 per cent. of phosphates, and often even less.

In March, 1920,* the subject was discussed by the Faraday Society, and a resolution was adopted recommending the Ministry of Agriculture to appoint a committee to study the basic slag problem. Lord Lee, who was then Minister of Agriculture, acceded to this request, and a permanent committee was set up in July, 1920, consisting of representatives of steel makers, slag grinders and agricultural consumers† “to consider the development and improvement of the manufacture of basic slag and the extension of its use.” This Committee has now presented to the Minister an Interim Report‡ which is summarised below.

The Committee discussed: (1) The quantity of slag producible assuming our present steel output to be maintained, and a comparison of this amount with the estimate of Sir Thomas Middleton showing how much slag can advantageously be utilised by farmers in this country; (2) The possibility of increasing the amount or quality of the slag by some method additional to the ordinary steel making processes; and (3) The agricultural value of the slags now obtainable.

(1) **Quantity of Slag Available.**—The National Federation of Iron and Steel Manufacturers has obtained from the steel makers returns of which the following are short summaries. The

* The report of the discussion “Basic Slags: their Production and Utilisation in Agriculture” was published in the Transactions of the Faraday Society, Dec., 1920, Price 7s. 6d.

† The composition of this Committee is now as follows:—Dr. E. J. Russell (Chairman), Mr. T. Baxter, Mr. G. A. Bellwood, J.P., Mr. Colin Campbell, J.P., Mr. G. Coleman, Dr. Arthur Cooper, Mr. R. R. Enfield, Mr. G. Hatton, Mr. Mannaberg, Mr. G. V. Parker, Mr. H. G. Richardson, Dr. W. Somerville, Mr. J. G. Stewart, Mr. B. Talbot. *Secretary*, Mr. W. R. Black, Ministry of Agriculture and Fisheries, 4, Whitehall Place, S.W. 1.

‡ Not at present to be printed elsewhere.

amounts of slag produced in Great Britain in the year ended 30th September, 1920, were :—

<i>As P_2O_5.</i>			<i>As Phosphate.</i>			<i>Quantity.</i>
						Tons.
Under	5 per cent.		Under	11 per cent.		22,522
5 and under	7 "		11 and under	15½ "		118,011
7 "	10 "		15½ "	22 "		302,346
10 "	12 "		22 "	26½ "		90,928
12 "	15 "		26½ "	33 "		121,357
Over	15 "		Over	33 "		46,229
			Total	...		701,393*

It may be doubted whether the 22,500 tons of slag containing less than 5 per cent. of P_2O_5 (=under 11 per cent. tricalcic phosphate) would be worth grinding. The 118,000 tons of next higher grade (11 to 15½ per cent. tricalcic phosphate) may be found to have more value than appears from their phosphate content, but owing to high cost of transport and present uncertain knowledge as to their value would not at present be as eagerly sought by farmers as the higher grades. There remain, therefore, some 560,000 tons of slag, containing more than 15½ per cent. phosphate of which only 46,000 tons is of the basic Bessemer type (more than 33 per cent. phosphate).

Before the War the steel makers produced, and the farmers consumed, some 260,000 tons of high-grade slag; last year 46,000 tons only were produced, and apparently even this small production cannot be relied upon in the future.

The above table shows that, as regards units of phosphate, the farmer is not placed on such a short ration as might at first appear. The 260,000 tons of high-grade slag of pre-war days contained 9,880,000 units of phosphate; the 560,000 tons of last year's slag contained 13,400,000 units. Adding in the units contained in the 140,000 tons of the lowest two grades the figure becomes 15,200,000 units.

The problem appears in a less favourable light, however, when it is remembered that farmers before the War were not using anything like as much slag as in the opinion of competent authorities they might with advantage have used. Sir Thomas Middleton estimated that no less than 890,000 tons per annum might be used in the United Kingdom, equivalent to 33,820,000 units—some 2½ times the present output.

* Excluding the production of four firms from whom no returns were received.

The amounts disposed of for manurial purposes and for other purposes in Great Britain in the year ended 30th September, 1920, were as follows :—

<i>As P_2O_5.</i>				<i>For Manurial Purposes.</i>	<i>Other.</i>
				Tons.	Tons.
Under	5	per cent.		5,423	15,459
5 and under	7	"		26,745	86,060
7	10	"		223,292	53,321
10	12	"		84,419	2,792
12	15	"		122,052	1,169
Over	15	"		46,309	—
				508,240*	158,801*
TOTAL				...	...
				...	667,041* tons.

The total deliveries of basic slag in England and Wales in 1919-20 were 407,000 tons, as compared with an area under crops and grass of 26,507,000 acres, an area under permanent grass of 14,487,000 acres, an area under clover and rotation grasses of 2,448,000 acres, and an area under mountain and heath land used for grazing of 4,162,000 acres. Very little basic slag is coming from abroad : in 1920, 17,584 tons were imported and 11,154 tons were exported.

(2) **The Possibility of Increasing the Amount or Quality of Slag.**—The Committee is assured that practically the whole of the phosphorus entering the iron works is contained in the slags mentioned above, and that there is no significant loss or balance unaccounted for. It follows that if the output of steel remains constant the slag figures will remain substantially as they are except that the highest grade will tend to become more scarce and the others proportionately to increase. The Committee has therefore enquired into the possibility of increasing the phosphorus output by some method additional to the ordinary steel-making process, such as the following :—

(a) *Addition of mineral phosphate to slag in the ladle.*—This would be advantageous only if the agricultural value of the mineral phosphate were improved.

Four experiments carried out by Mr. George Hatton at the Earl of Dudley's Round Oak Works, in which mineral phosphate was added to slag in the ladle in the proportion of approximately $\frac{1}{2}$ cwt. of rock phosphate to a ton of slag, may be summarised as follows (average of four experiments) :—

* Of these totals, 260,187 tons were ground in manufacturers' own works, 248,053 tons were sold for grinding elsewhere, 75,233 tons were sold for purposes other than fertilising, while 83,568 tons were dumped with all kinds of works rubbish and were consequently valueless for manurial purposes.

				<i>Composition of Rock Phosphate.</i>	<i>Composition of Slag</i>	
				per cent.	<i>Before Addition.</i>	<i>After Addition.</i>
					per cent.	per cent.
CaO	...	...	...	51.92	48.75	50.4
P ₂ O ₅	...	...	...	35.63	9.66	10.66
Solubility	...	...	...	17.87	88.88	76.95
Total Calcium Phosphate				77.82	21.05	23.23

There is no indication of any sufficient alteration in the mineral phosphate to justify the process.

(b) *Use of iron ore containing more phosphorus or addition of phosphates in the blast furnace*, with the express purpose of obtaining a more phosphatic pig iron and therefore a more phosphatic slag. It is agreed that this would constitute a satisfactory solution of the agriculturist's problem, but from the steel maker's point of view it adds to the cost of production of the steel, and therefore could be adopted only if the price of the slag were sufficiently attractive.

(c) *The re-introduction of the two lowest grades of slag into the blast furnace*, whereby a more phosphatic pig iron would be produced, which, again, would yield a higher phosphatic slag. This course would not increase the total units of phosphate, but would increase the proportion of higher to lower grades.

(b) and (c) are still being investigated by the Committee.

(3) **The Agricultural Value of the Slags now obtainable.**—

The Committee felt bound to consider the possibility that no improvement may be practicable in the quantity or quality of basic slag, and it has therefore initiated experiments to ascertain the agricultural value of present-day slags in comparison with the basic Bessemer slags. These experiments were put in hand at the beginning of the enquiry. Mineral phosphates are included in the trial in order to ascertain whether they could justifiably be used in increasing the phosphatic content of the slag.

Fortunately, the Agricultural Education Association had already begun a series of trials on arable and hay land, and Dr. G. Scott Robertson has carried out various hay tests and has projected feeding trials. These trials give some, but not all, of the information the Committee needs. Further experiments have, therefore, been arranged at Rothamsted to elucidate the following points:—

1. Whether the soluble and insoluble open hearth slags differ in agricultural value; if so, whether some method of evaluation can be devised better than the present citric acid test.

2. Whether the open hearth slags are inferior to Bessemer slags when applied in quantities containing equal amounts of phosphorus.

3. Whether finely-ground mineral phosphates differ greatly in value from basic slag.

4. Whether the manurial effect of basic slag is wholly dependent on its phosphate content, or whether other constituents (manganese, etc.) should be considered of value.

To test the first three problems, a series of experiments has been arranged at Rothamsted on meadow land laid in for hay, and on root crops; also a feeding trial with sheep (six plots, each of approximately 2 acres). The fourth problem is more difficult, but it is being studied, in the first instance, in pot experiments at Rothamsted. The results so far obtained from the fourth series lend no support to the idea that manganese is of value.

THE SCARCITY OF SWALLOWS.

HENRY BOASE.

THIS summer the scarcity of swallows and the martins has been a subject of general remark, and various theories have been put forward as to the reason of the scarcity. Some of these theories have been rather fantastic, and a few notes on the subject may be of interest.

Some of the factors which may affect the numbers of these birds have been examined and a general statement has been prepared. In doing so it has been thought advisable to include the swift with the *Hirundinæ*, as a general similarity of its feeding habits causes it to be affected by some of the conditions which may influence the distribution of the swallow and its relatives. The four birds (swallow, martin, sand martin, and swift) are at times referred to hereafter as a group, but it must be understood that this is a matter of convenience only. The swift has no relationship with the Hirundines and differs in many important features of structure and habit, but, feeding in the air in common with the three true Hirundines, it may be considered along with them in that connection.

These notes express the situation as gathered in Scotland, representing a point of view rather than an authoritative statement, and are not intended to represent any degree of finality in so complex a matter.

Certain general features call for some explanation, and accordingly an account of certain aspects of habit is given in order to make clear the ideas put forward in connection with the reduction of numbers.

Food Habits.—As a group, these birds are remarkable for the manner in which they feed. Practically all their food consists of winged insects secured in flight; in the swallow only have I noticed any attempt to secure insects on the ground. Some are also picked from the surface of still water while the bird is drinking or bathing, but these represent a very small proportion of the total quantity consumed. All members of the group seem to spend their time almost solely in obtaining food. The swallow and martins appear to hawk around the neighbourhood where the nest is situated, and seldom wander unless under stress of weather. In high wind, the flight of the insects on which they feed is naturally impeded, and the insects tend to gather in sheltered places, in the lee of woods, in hollows, etc., and are pursued there by the birds. All the Hirundines seem

to show a preference for damp and marshy areas, and may be attracted by the wealth of insect life there met with. Swifts, on the other hand, are far less confined and seem to seek food over a wide area. Also they hawk at higher elevations than the Hirundines and may consequently feed on different insects. In Scotland, they feed commonly over moors on the high ground where the swallow and its congeners never go, miles distant from their nesting places.

The food supply, aerial insects, is liable to considerable variation as a result of weather changes—high winds, heavy rain, and frost. The last two, in particular, seem likely to be the most potent—the rain by “washing down,” and the frost by “cutting down” and so killing off insect life. Consequently the group is endangered through possible food shortage as a result of these weather fluctuations.

The insect life which supplies the food of these specialised birds does not appear to be defined beyond “winged insects.” It is clear, however, that the insects themselves will be affected by weather conditions, and that to some extent the species present in any given area will be dependent on the vegetation growing there, and on the moisture in the soil and atmosphere. Drought may cause a falling-off in the number of insects, though this will affect different species in different ways, and changes in the vegetation of an area—the cutting down of woods, or even the change from arable land to pasture—will probably have an effect on the number and species of the insect population. Consequently the matter of food supply for the birds depends on the weather and vegetation, which vary and interact the one on the other.

Migration.—The four species under consideration pass through the dangers of migration twice each year in their journeys to and from these islands. Ever since the reality of these great flights was accepted, it has been a matter of surprise that the migrant species should be capable of making so prolonged an effort. Recent investigations tend to overthrow the older conception of a thousand miles flight in a night, but nevertheless these movements, even if taken in stages, indicate an endurance quite unexpected. In migration itself, the overseas flights are naturally the most dangerous, and it is during these journeys that weather changes can cause great havoc in the ranks of the travellers. Weather can affect migrants in two important respects, the one in regard to the actual physical effort, the other in regard to food supply when land is reached. The species in question travel for

the most part during the day, and no doubt refresh themselves with such insects as cross their path during the flight, but cold and wet weather must take a heavy toll of travel-weary birds, as a result of exhaustion from want of food.

Conditions differ somewhat in spring and autumn. *In spring*, the birds tend to follow the lines of the isotherms as the season advances; consequently disaster is less likely to overtake the main body of migrants through unexpected cold. Exceptional weather in May, however, may kill off many birds soon after their arrival. *In autumn*, an early break up of the weather may cause considerable losses among the young of the year making their first journey south. In this connection, it is probable that food supply and not temperature is the real crux of the matter, as frequently the birds travel overland at least under severe conditions, in wind and driving rain, at times when the real urgency of departure due to cold does not press upon them.

It has become increasingly evident that migrants (particularly the species under consideration) do not in general on arrival occupy the first suitable area they come to in their journey, but pass on to the particular place which was their nesting ground in the previous year, or, in the case of young birds, the scene of their upbringing. Further, there is every reason to believe that the same wintering areas are occupied from year to year, and that a constant route is traversed between the summer and winter quarters. Admittedly these are matters hard to prove, but the repeated return has been demonstrated frequently in the case of the swallow and house martin, and the probability of the succeeding ideas seems reasonable.

Decrease of the Swallows.—The question of the gradual decrease of the swallows is a complex one, and the decrease is probably not due to immediate causes but may extend back over many years. We are recording to-day the effect of some change in conditions which has reacted unfavourably on the group. The last thirty years or so have been marked by several remarkable extensions of breeding range, notably in the case of the starling, the tufted duck, and the great crested grebe, while other species have become restricted. The great reduction in the number of predatory birds and animals doubtless has had its effect in certain cases, but notwithstanding the study which has been given to these variations, very little indeed has been elucidated as to their real causes. We have only to consider the vast changes which have been made in the conditions of this country—the draining and improvement of agricultural land, the development

of industry (can we measure the bad influence of coal smoke?), the changes from forest to clearings, pasture to arable and the reverse—to realise that it is actually surprising that the changes are so small.

It has been established that in spite of the recollections of the “oldest inhabitants,” there has been little or no change in the average weather conditions of Great Britain within the records available; consequently, in spite of fairly general opinion, weather as a sole cause must be ruled out.

The effect of weather on average food supply is accordingly improbable, but from what has been stated regarding the homing instincts of these birds, it can be seen that a series of unfavourable summers might bring about a decrease which would take some years to remedy. Any lack of food reacts on the adults themselves, rendering them less vigorous and causing a reduction in the brood, and the brood in turn is affected by the prevailing shortage. Two or sometimes three broods are normally reared in a season, and obviously smaller broods, and the possibility that only two broods, and in some cases but one brood, will get away, are conditions which would tend to result after bad weather, while the condition of both adults and young will be less favourable for their southward journey. Under average conditions, the annual increase just about balances the appalling losses of life during the remainder of the year, so that a succession of cold wet summers—or even one (1920 for instance)—leaves a decided mark on our bird population. This loss must be made up by the birds normally nesting in this country, since the number of strangers which turn aside and become as it were new settlers cannot be large.

Further, it is possible that the gradual draining of many parts of Great Britain is responsible for more permanent changes. To take a definite area, the Carse of Gowrie, bordering the Tay Estuary, has undergone considerable changes within comparatively recent times. At one time marshy, now well drained, not so long ago one of the leading grain-growing areas, now largely given to grazing, even within the last twenty years the reduction in numbers of swallows has continued steadily. At one time, the villages were the homes of hundreds of house martins; now only a few pairs return. On the other hand, in certain of the glens in the Grampians, the numbers appear to be much the same as in years past. In these glens, little or no change has come about in the character of the country except where holdings have been abandoned, and on the whole, numbers seem to be fairly steady.

As already stated, the swallows show partiality for wet ground, and in Northern Europe, where insect life is abundant in the swamps, these species summer in large numbers. In this country, the Hirundines roost in large numbers in reed beds where these exist, particularly in the autumn when collecting for their departure. The food supply of these marshy areas is possibly the attraction which has developed this habit.

There appears to be a tendency for the swallows to make an earlier departure. During recent years, in the Tay Estuary, considerable passage movements have been met with annually in July, in the second week in some cases, and the sand martins are moving sometimes in the first week. Many of these must be young birds, but with them a considerable proportion of adults is usual. It is clear, therefore, that in the case of these birds it is scarcely likely that more than one brood has been reared, as in Scotland, some districts, even in Forfarshire and Perthshire, are not colonised until the second week of May, and in the glens the house martin may only start building in the beginning of June.

It has been suggested in certain quarters that perhaps some special dangers have arisen which confront the birds during their migration, but it seems scarcely conceivable that destruction could be wrought on a scale sufficient to make a marked difference over the whole area of Great Britain. It is quite possible that an exceptional storm might cause a local shortage at some point owing to the death of the birds building there, but it has been proved that the various birds occupying a district do not necessarily arrive or leave at the same time. Consequently, in general, some get through to preserve a colony.

It is apparent that the swift, in spite of the similarity in some of its habits to those of the swallow group, has not suffered so great a loss in recent years. In fact, in Scotland, the swift is recorded as exceptionally numerous in 1913, pointing to the fact that it is at least maintaining its footing there. In view of the fact that only two young are reared in a brood and one brood only is brought up during the season, the mortality in migration and in its winter home must be very much less than that of the swallows and martins, a problem itself worthy of investigation.

PACKING APPLES IN BOXES.

J. TURNBULL,

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Box packing of apples is apt to appear rather complicated to the uninitiated, and the older methods actually were so, because considerable judgment was required to decide which method to use for a given size of fruit. Several methods might be used for the same size, and there was always doubt until the pack was nearly completed whether it could be made the right height or not. Packing has now been reduced to an exact science, and the standard method is very simple once the details have been mastered. There is only one method for each particular size, and when this is followed a good and tight pack is obtained every time.

When apples were first boxed in this country, about ten years ago, the most up-to-date methods then in use in the Western States were adopted. These methods have long been superseded in their country of origin, but are still largely used over here. The square pack is now little used, but the off-set pack has still some supporters. It may be attractive under some conditions, but it cannot always be used. The diagonal pack, however, can be used for any size or shape of apple, so long as the fruit is graded correctly, and experience has proved it to be much superior to any other pack both in remaining tight after much handling and in taking great pressure without bruising the fruit. Further, the use of one pack only has obvious advantages.

Even when the diagonal pack is used, the result is not always satisfactory. The shape of our fruit is often blamed, but it is usually the case that the method of grading is not understood. A complete system, described below, has now been adopted, and with it there are no uncertainties. The chief feature of this system is that the apples are chosen at the time of packing. They are not merely previously divided into sizes which are themselves packed: this requires great ingenuity and is often impossible. The idea of first dividing up into fixed sizes and then trying to find a pack that will suit the sizes is the snag which so many growers are up against. They continue to grade by means of rings or cards or by employing machines having the same principle, and then try to pack the sizes thus obtained. Apples, however, are so irregular in shape that this method can-

not arrange grades of even approximately the same size. The result is that many packs have to be used, sometimes two in one box: the same sizes may be packed in several ways, and even then the finished pack is very often too high or too low and the fruit is consequently bruised. To some extent this is obviated by turning some of the apples or by making up with wood wool or in other ways—an unnecessary complication with results which are seldom satisfactory. If it is carefully followed the newer system gives a better result and does away with all needless troubles. The actual placing of the apples in the box requires very little practice and less skill, but what is generally known here as grading does require a certain amount of both skill and practice. This grading is for both quality and size, but selection for size would be more correctly described as sizing. No skill is required to remove blemished, damaged or poorly-coloured fruit, though care is necessary. The real difficulty lies in selecting the correct sizes for packing, or sizing. It is usually stated that successful packing depends upon selecting apples of *as nearly the same size as possible*. There is more in this statement than meets the eye. Under the older systems apples are sized by passing through rings or some similar device. Apples, however, are not round like tennis balls, and this method only measures the maximum diameter. Even if the actual average diameter could be measured, it would be useless, as it is only one of the factors included in size.

The point that really matters is the space occupied or bulk of the apple. Unfortunately this cannot be ascertained satisfactorily or even approximately by any practicable mechanical form of sizing. Most of the up-to-date machines now in use abroad size by weight, and if the apples are divided into a sufficient number of sizes, this is an improvement. No mechanical apparatus, however, has yet been produced which will divide the apples into sizes ready for packing. A little consideration will show why this is so. If a size comes out so that 156 apples would just fill a box, a little calculation, or a reference to the table given on p. 538 below, will show that the nearest numbers that will give an even number of layers are 150 and 163. If the packer puts in 150 the pack will be too loose: if he puts in 163 it will be too tight: the result in either case will be damaged fruit. This is an important point, and it may be clearer to those who are accustomed to thinking of apples as so much in diameter, if put in another way. It should be borne in mind that however near apples are in size to each other, there must still be some

variation. Even supposing that apples could be accurately measured for diameter, the difficulty of taking the height into account would still remain. Trial may show that a certain run of fruit packs quite well if the sizes are $2\frac{1}{4}$ - $2\frac{1}{2}$ in., $2\frac{1}{2}$ - $2\frac{3}{4}$ in., and so on, but in another run of longer apples these might not be suitable at all, and $2\frac{1}{8}$ - $2\frac{3}{8}$ in., $2\frac{3}{8}$ - $2\frac{5}{8}$ in., and so on, might be the sizes that would pack. In each of these sizes the variation would be $\frac{1}{4}$ in., but it comes in a different part of the scale. The correct starting point could not be ascertained until a trial box had been packed, and much time would be wasted. *The final selection for size cannot be made by machinery; it must be made by eye.* This need not alarm the would-be packer, because there are so many guides to help in the choice, that reasonable care is all that is required.

It would be both tedious and damaging to the fruit if all sizes were before the packer at once, so that a large number had to be rolled over to find the right size. It is not essential to divide the apples as picked into more than three sizes, large, medium, and small. There is no objection to using a machine for this, but in no case should the variation in size be less than $\frac{1}{2}$ in., and it must be clearly understood that this simply reduces the number of sizes from which the packer has to choose, and will not secure a size which can be packed right away without further selection. As will be shown, after the first few apples are placed in the box, the size and position of the rest are determined by those already packed.

It has already been stated that however nearly the same sizes are selected, there must be some variation. The extent of the variation is a matter for consideration. There is no doubt that the more nearly the apples are of the same size, the more easily and quickly can they be packed and the better will be the result. The maximum number of sizes, for example, between 213 (about $2\frac{1}{4}$ in. average diameter) and 113 (about $2\frac{7}{8}$ in. average diameter) is 9. If the quantity of apples to be packed is sufficiently large, this number of sizes can be packed most easily and quickly, and will give the best results. Where few apples are available, however, fewer sizes must be selected. This will not prevent the system being used, but it introduces an element of uncertainty; the selection of sizes requires more consideration and is less automatic, and the result depends upon the packer more than on the system. It is, therefore, better to make the maximum number of sizes, in fact to select apples of *as nearly the same size as possible*.

Having decided to pack on the *diagonal system*, to abandon the attempt to size by means of a mechanical grader only, and to make a final selection for size at time of packing, the necessary appliances and the actual method of sizing and packing remain to be determined.

Appliances.—A table to hold the fruit is necessary. The height and width should be 3 ft., and the length 5 ft., or more as convenient. Stout canvas should be stretched across the top, and to prevent too great sagging, webbing such as is used in chair making should be fixed 3 in. below. A little under this a shelf to hold lining paper will be convenient.

A box rest to hold one end of the bottom of the box level with the top of the table and the other about 9 in. lower is required. This may be attached to the side of the table, or a separate holder may be made, but it should be so placed that the packer may stand with the fruit on his right hand and the box in front of and sloping towards him. If wrapping papers are used, a suitable receptacle may be hung on the side of the box.

The supply of boxes must be of the recognised size and material, or the proper strength and elasticity will not be obtained. The inside measurements of the box, and the measurements of the pieces of which it is composed are :—

Made-up box, $18 \times 11\frac{1}{2} \times 10\frac{1}{2}$ in.

2 solid ends, $11\frac{1}{2} \times 10\frac{1}{2} \times \frac{3}{4}$ in.

4 side pieces, $19\frac{1}{2} \times 4\frac{3}{4}$ by $\frac{5}{16}$ in.

4 top and bottom pieces, $19\frac{1}{2} \times 5\frac{1}{4} \times \frac{3}{16}$ in.

4 cleats, $11 \times \frac{3}{4} \times \frac{1}{4}$ in.

A box press for holding down the ends while the box is being nailed, or some effective contrivance for attaining this object, is essential, together with a supply of cement coated nails and a hammer, a nail drawer and a box opener.

The Numerical System.—Only four packs are necessary to take all sizes from 270 to 36 (that is from about 2 to $5\frac{1}{2}$ in. in diameter). They are known by the number of apples in the rows across the box: 3-3, 3-2, 2-2, and 2-1 diagonal. For example, the 3-2 pack has 3 apples in the first row and 2 in the second row, and so on 3 and 2 alternately. The 3-2 pack has always 5 tiers or layers of apples, the 2-2 has 4 tiers, the 2-1 has 3 tiers, and the 3-3 has 6 tiers.

There are 10 sizes in the 3-2 pack, 10 in the 2-2, 5 in the 2-1, and 4 in the 3-3. The pack is further distinguished by stating the numbers of apples in the vertical rows after the above. For instance, the 3-2, 6-5 pack has 3 and 2 apples alternately in the

horizontal rows and 6 and 5 alternately in the vertical rows. The total number in the box is thus easily calculated. In this case there are 3 rows of 6 and 2 of 5 in the first tier or layer, or 28 altogether. In the next tier, as explained later, there will be 3 rows of 5 and 2 of 6, or 27 apples. As stated above there are 5 tiers in the 3-2 pack, and as the first tier contains 28 apples, there will be 3 of 28 and 2 of 27, making a total number of 138 apples in the box. This number is used to indicate the size of apple packed. In order to avoid calculating in this manner, a table of sizes is given at the end.

Preparing to Pack.—Having placed the apples, after preliminary sizing, upon the packing table, and the box upon the box rest, the packer stands so that the apples are on his right hand and the box in front of and sloping endways towards him. Wood wool should not be used, because if little is used it has no effect, and if much is used the pack will be loose. Only one thing will keep apples tight, and that is apples. The lining paper (tissue 18 or 20 x 30 in.) is placed on the shelf below the table, and wrapping papers, if used, in a suitable receptacle hung upon the side of the box.

Two pieces of lining paper are folded and placed so that each piece covers rather more than half the bottom, and comes up the side and hangs over, to be folded in to cover the apples when the pack is complete.

The first layer packed will probably be more level than the last, and therefore it is arranged that the first layer packed shall be exposed when the box is opened, *i.e.*, the bottom of the box at time of packing afterwards becomes the top.

Rules for Deciding Pack to be Used.—These rules must be strictly followed. In the 18 in. box all sizes and shapes of apples are packed on their side with the eye towards the end of the box.

1. If 5 apples of as nearly the same size as possible will go in a row across the box, but not 6, the pack is 3-3. This is only used for special highly-coloured dessert fruit, as the sizes are too small for ordinary use.
2. If 4 apples will go in a row across, but not 5, the pack is 3-2.
3. If 3 apples will go, but not 4, the pack is 2-2.
4. If 2 apples go, but not 3, it is 2-1.

It has been said that these rules are not reliable, because sometimes when 4 have gone in and not 5, they would not pack 3-2, but this is due to a misunderstanding of the method of sizing.

Method of Sizing at Time of Packing.—When the apples are being packed by the method about to be described, the apples should be as nearly as possible of the same size, and of such

a size that they will just fit the space available, keep the rows at right angles to the box, and in the case of all but the first tier, keep the rows in line with those beneath. Care should also be taken to keep the apples well pressed towards the end of the box. When the first tier is nearly completed, it may not exactly reach the end of the box. If the last row will not go in, the whole tier should be looked over, and 2 or 3 of the larger apples taken out and replaced by slightly smaller ones. If the tier is then pressed firmly towards the end at which packing commenced, the last row should just go in. If the last row is too loose, 2 or 3 of the smaller apples should be replaced by slightly larger ones. This operation has decided the size of apple that is being packed, and it is the only way of securing a really tight and effective pack every time without fail. The first row decides the success of the pack, and if it is well packed in accordance with the method, no difficulty will be found in packing the other tiers.

It has been stated that 4 apples might go in and not 5, yet the 3-2 pack would not come right, because the second row might slip into the first. Should this occur, it is clear that an attempt is being made to pack apples which have already been sized, and the method of sizing at time of packing as described above has not been followed. As the whole system depends for its success upon this method, it is important that it should be made perfectly clear. To take an extreme case, let us suppose that the packer has selected 5 apples which are $2\frac{1}{2}$ in. in diameter one way, and $2\frac{1}{4}$ in. another. If they are placed the $2\frac{1}{2}$ in. way the fifth will not go in because $5 \times 2\frac{1}{2}$ in. is $12\frac{1}{2}$ in., and the box is only $11\frac{1}{2}$ in. wide. If, however, they are placed the $2\frac{1}{4}$ in. way the 5 will go in easily. This merely shows that the average size is too small. If this has occurred and the apples in the second row will not hold their position, those particular apples should be rejected, and others very slightly larger chosen. The average size will then be large enough to pack 3-2. It has already been stated that the sizes must be chosen so that they will pack. The apples rejected will, if not too small for boxing, pack with the 3-3 pack.

The 3-2 Diagonal Pack.—Sizes coming under Rule 2 should be packed as follows: Select 3 apples as nearly the same size as possible; place one in each of the lower corners of the box and the third midway between these two. In the two spaces thus made in front of these apples place 2 apples for the next row, choosing them and fitting them according to the previous paragraph. Then complete the rows with 3 and 2

apples alternately. Commence the second tier by placing 2 apples in the two spaces or pockets between the first 3 apples in the first tier, then place 3 and 2 alternately until the end of the box is reached. The third tier will commence with 3, the fourth with 2 and fifth with 3.

If care has been taken to observe the points mentioned, it is impossible for the pack to fail to come the right height.

The 2-2 Diagonal Pack.—One apple of any of the sizes ascertained by Rule 3 is placed in the left hand corner of the lower end of the box, and a second, as nearly the same size as possible is placed midway between the cheek of the first apple and the other side of the box. The second row is made by pressing one apple into the space between the first two apples, and the other in the space between the second apple and the side of the box. The rows are continued to the other end of the box in a similar manner.

The 2-1 Diagonal Pack.—One apple of any size ascertained by Rule 4 is placed in each of the lower corners of the box. The second row consists of one apple only of as nearly the same size as possible, which is placed in the space between the first two. The pack is then completed 2 and 1 alternately as already described.

The 3-3 Diagonal Pack.—One apple of one of the sizes indicated by Rule 1 is placed in the lower left hand corner of the box. In the space between that and the right hand corner, two apples of as nearly the same size as possible are placed, so that the three spaces left—two between the apples and one between the last apple and the side of the box—are equal. In these three spaces three similar apples are placed, and so on, always 3 apples in a row.

Nailing up the Box.—With the pack complete, and projecting about one inch above the box, the box is transferred to the nailing press, lining papers folded over, bottom boards put on, and pressed down carefully by the machine. This presses the apples carefully into place, where they are tightly held by the spring of the top and bottom boards. The bottom can then be nailed down, through cleats if these are used, without fear of splitting. The box is taken out of the press, turned upside down, for the reason already stated, and pencil marked with the name of the variety and count (or number of apples in the box) ready for labelling.

Further Points.—When the packer has gained experience, there are three further points which may be watched: (1) After

placing the first two rows, the rest may be packed diagonally. This is much quicker, but should not be attempted until the packer is able to keep his horizontal rows straight, and his pack tight.

(2) Wrapping papers may be used. This lessens risk of damage, prevents the spread of disease, gives an attractive appearance, and actually saves time in packing.

(3) During packing the apples may also be selected so that the size gradually increases towards the middle of the box, though the variation should not be so great as to be noticeable. This will give a natural bulge to the pack and will help to keep all tight. The importance of this bulge, however, can easily be overestimated, because with the diagonal pack, the pressing will naturally press the apples towards the middle of the box, if it is carefully done, and a bulge will thus be obtained.

Table of Packs and Sizes.

The number in the last column is used to indicate the size packed.

Pack.		Number of Apples	
		in each Tier.	in Box.
2—1 Diagonal	2—1, 4—3	11, 10, 11	32
	2—1, 4—4	12	36
	2—1, 5—4	14, 13, 14	41
	2—1, 5—5	15	45
3 Tiers.	2—1, 6—5	17, 16, 17	50
	2—2, 3—3	12	48
	2—2, 4—3	14	56
	2—1, 4—4	16	64
2—2 Diagonal	2—2, 5—4	18	72
	2—2, 5—5	20	80
	2—2, 6—5	22	88
	2—2, 6—6	24	96
4 Tiers.	2—2, 7—6	26	104
	2—2, 7—7	28	112
	2—2, 8—7	30	120
3—2	3—2, 5—4	23, 22, 23, 22, 23	113
	3—2, 5—5	25	125
	3—2, 6—5	28, 27, 28, 27, 28	138
	3—2, 6—6	30	150
Diagonal	3—2, 7—6	33, 32, 33, 32, 33	163
	3—2, 7—7	35	175
	3—2, 8—7	38, 37, 38, 37, 38	188
	3—2, 8—8	40	200
5 Tiers.	3—2, 9—8	43, 42, 43, 42, 43	213
	3—2, 9—9	45	225
3—3 Diagonal	3—3, 6—6	36	216
	3—3, 7—6	39	234
	3—3, 7—7	42	252
	3—3, 8—7	45	270

Illustrations of all sizes when packed have frequently been published, and Figs. 1 to 3 together with the text may suffice to explain the whole system.

Examples of Position of Apples in First Tier.

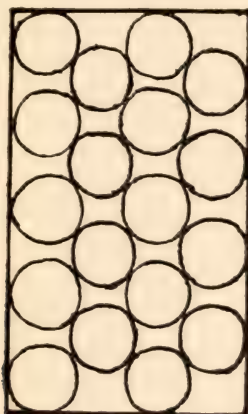


FIG. 1.—2-2, 5-4 pack.

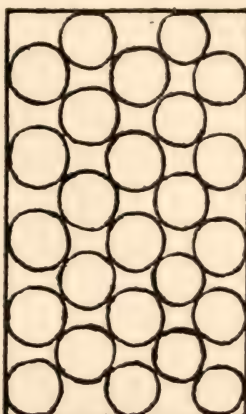


FIG. 2.—3-2, 5-5 pack.

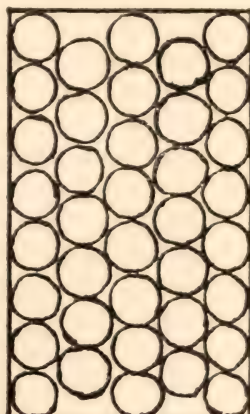


FIG. 3.—3-2, 8-7 pack.

The writer wishes gratefully to acknowledge that some of the ideas in this article were suggested by a perusal of bulletins issued by the Australasian and Canadian Government Departments.

IMPERIAL FRUIT SHOW.

As a result of visits paid in 1920 to the Commercial Fruit Shows held in the fruit-producing districts (Maidstone, Worcester, Wisbech), the impression was gained that while these shows served an extremely useful purpose in educating growers and stimulating individual efforts in the direction of producing superior fruit, there was a great need for co-ordinating the activities of the Societies concerned, (1) in order that the prize-winning exhibits at individual shows might have an opportunity of competing against each other, and (2) so that the public in the large towns of the country might be afforded an opportunity of seeing what an excellent standard of production is reached by British growers, and that they too might be educated and assisted in the selection of the varieties most suited for dessert and culinary purposes. The latter point is of great importance since the public need much convincing that British-grown fruit is really equal to the imported varieties of which they see so much during the greater part of the year.

The Horticulture Division of the Ministry gave very serious consideration to this matter and arrived at the conclusion that it was necessary, and should be possible, to arrange for a National Fruit Show to be held annually in one of the large cities, and that, if possible, the first of these Shows should be held in London. In the course of a speech made at Worcester, the Controllor brought this suggestion before members of the industry, and subsequently a meeting was called to consider how it could best be carried into effect.

Before any definite conclusions were arrived at the matter was taken up by the *Daily Mail*, one of the Directors of which offered (provided that the trade would give adequate support) to organise the first show and to assume the financial responsibility of the undertaking. An Advisory Committee representing the Commercial Horticultural Industry of the British Empire was convened by the Ministry and agreed to co-operate on the basis that all matters of finance and general organisation in connection with the show were left to the *Daily Mail*, but that the decision of the Committee on technical matters should be given effect to.

It was on these conditions that all the several bodies co-operated to make it possible to hold an Imperial Fruit Show.

Work of Advisory Committee.—The Advisory Committee was constituted of representatives of the leading British Commercial Fruit Shows of Kent, Midlands and Eastern Counties, the Fruit

Commissioner for Canada (Ontario, British Columbia, Quebec and Nova Scotia), the Royal Horticultural Society, Chamber of Horticulture, Federation of British Growers, National Farmers' Union, Horticultural Trades' Association, National Federation of Fruit and Potato Trades' Association, National Federation of Retail Fruiterers and Florists, and the National Association of Cider Makers, with the Controller and Deputy Controller of Horticulture representing the Ministry.

The Provincial Show Committees mentioned below decided to give full support to the undertaking, and, this year, to make their annual shows integral parts of the Imperial Fruit Show, instead of holding them separately and in the provinces. The Committee, therefore, decided to devote a section each to the Kent Commercial Fruit Show, the East Anglian Commercial Fruit Show, and the West Midland Commercial Fruit Show. Each of these sections will be organised as in past years by their respective Show Committee. A further section has been arranged for apples from Overseas, and for this the Canadian Fruit Branch has agreed to act as agents in Canada. An Amateur Section will be reserved for apples grown in private gardens and allotments. Cider fruit has not been overlooked, and three classes for suitable apples have been included in the schedule: the National Association of Cider Makers and the National Cider Institute will organise this section. It will be seen, therefore, that the co-operation and support of all the Associations connected with the fruit industry have been obtained. There will be further classes open to the whole of the United Kingdom, and two classes open to all fruit growers or associations of fruit growers in any part of the British Empire. It is in these latter classes that the highly-coloured produce of British Columbia and Ontario will be seen in keen competition with the sober-hued but more highly-flavoured apples grown in the Mother Country. There is no doubt that this competition will evoke considerable interest.

It is a matter for regret that the date of the Show will not permit of the competition of produce from South Africa, Australia and Tasmania, but it is not clear that any date could be selected to permit of competition of apples from all parts.

Education Exhibits.—In addition to the competitive classes specified above, provision will be made for exhibits dealing with the many phases of fruit-growing, and in this connection it is hoped that the Ministry will be able to stage a scientific exhibit dealing fully with grading and packing of apples, plant hygiene

and pest control. Exhibits demonstrating the results of recent research will probably be shown by the Research Stations of Long Ashton, East Malling, and Campden. Moreover, the Cider Makers Association have agreed to provide the money necessary to permit of a demonstration of cider-making being given daily during the exhibition by the Long Ashton Research Station under the direction of Professor Barker. Exhibits of traders interested in the horticultural industry will naturally find a place in the show. The Dominions will stage very attractive exhibits of fruit and will probably also arrange an attractive side-show of films dealing with fruit-growing.

Propaganda.—For the size of the population this country consumes far too little fruit, especially when it is realised that large masses of the population live in towns and lead sedentary lives. The general health of the nation would perhaps be much improved by an increased consumption of fruit. To promote this it is hoped to arrange for the co-operation of the Federation of British Growers, the National Federation of Fruit and Potato Trades' Association, and the National Federation of Retail Fruiterers, in the direction of convincing the public of the value of an increased consumption of home-grown fruit.

Place of the Show.—The Exhibition will be held at the Crystal Palace, between October 28th and November 5th. In many ways the Palace is well adapted for the purpose. It is easily accessible and contains abundant space for competitive and trade exhibits, as well as halls and club rooms for meetings, and a cinema theatre for film displays.

Conferences.—Horticulturists interested in apple growing and the fruit industry in general will come to the show for at least one day; and it is hoped that daily conferences will be arranged by various sections of the industry. One day will be given up for a discussion on grading and packing, and the manufacture and use of standard packages, and an attempt will be made to secure agreement on this question. Another day will be set aside for the discussion of insecticides and fungicides, and their use in controlling insect pests and plant diseases. The cider makers will probably also meet and discuss ways and means for popularising cider—particularly in the direction of using an official label as a guarantee of the quality of the beverage.

Popular addresses will also be given on such subjects as the apple tree, bud formation, and others.

THE WORKING OF A FEDERATION OF WOMEN'S INSTITUTES: DORSET.

BENITA LADY LEES.

WOMEN'S Institutes were started in three Dorset villages in the latter part of 1915, their formation then being more with the object, in a temporary way, of increasing the food supply, than of giving life to a far-reaching movement.

The amount of progress made through the Dorset Women's Institutes in home industries and generally in increasing knowledge affecting the home, garden, and field, has been far greater than was ever the case in any five years before the introduction of this movement into the country. Further developments may be anticipated, which should ultimately lead both to an improved rural education and to a higher efficiency among all county women. The simplicity of the movement at once appeals to all, and its stability is assured, its foundations being centred in the home—the national training ground for good citizenship. The three Institutes started in 1915 were for nearly two years the only ones in the county, but towards the middle of 1917 the Dorset Women's War Agricultural Committee undertook propaganda work, with the result that 18 further Institutes came into existence. Shortly afterwards a County Federation was formed. It is consoling to look back to the early days of the Federation and to know that in place of total ignorance of organisation on the part of the inexperienced officers, there is now a certain amount of order and system, and that the Institutes of to-day are out of all comparison better provided for and are working in closer co-operation than was the case in 1917.

A few details of the Dorset Organisation may be of interest, even if they be regarded merely as a milestone to show progress and how far off the goal still is. Among the members of the first Federation Committee were an "Organiser of Speakers" and an "Organiser of Industries"; the former of these offices still exists. A register of all local speakers and demonstrators is kept, and tours are arranged in connection with special subjects.

The office of Organiser of Industries soon had to be merged into a sub-committee having its own secretary, and excellent work has been done. The county is fortunate in having a flourishing and well-run Arts and Crafts Association, and its Secretary gives valuable assistance on the Handicrafts Sub-Committee of the Federation. The change in the title of this branch from "Industries" to

“ Handicrafts ” indicates a lesson learnt as to a national characteristic. The original idea was to encourage industries on commercial lines. The Institute was to turn out articles by the gross to provide the Institute with funds. The County Organiser was to be responsible for supplying raw material and for making contracts to supply “ the trade ” with the products of the various industries; she was supposed to compile a register of Home Industries in England and to keep in touch with like developments in other countries. Alas! in Dorset, at any rate, we did not like or understand undertaking contracts in our spare time, and, except in a few cases, we did not care to work up to standard. If we did make things the trade would take, we liked them to be sold in our own county at some shop where a relation could go and report as to their position in the window! By means of classes and showing at exhibitions, however, we still aim at making articles up to trade standard for orders, the object of exhibiting being more to obtain orders than to sell our exhibits bazaar fashion.

Meanwhile we work at the basis of this branch—the improving of each individual’s work—and have widened our list of handicrafts to include several “ home crafts.” The English housewife has not a good name for thrift, but on the programme of any Dorset Women’s Institute there are certain to be found demonstrations, lectures, or classes on a variety of home crafts. It almost seems as though thriftlessness is largely a product of the system of education in the past. Lessons in dressmaking, plain needlework, embroidery, millinery, dyeing, all branches of cookery, laundry work, upholstery, rugmaking, cobbling, and slipper and glovemaking, are asked for by nearly all, and the classes are always well attended and followed with much keenness. So great has the demand become for instruction in scientific cutting-out and dressmaking that we have had to ask the County Education Committee if it can provide an Instructor. The request for such classes was formerly not sufficient in Dorset to justify the employment of a teacher of dressmaking, but a change has come, even since the War, and is in no small way attributable to the study of home economics—one of the objects of the Women’s Institute Movement. The passing of the phase for anything cheap and the incidence of the new desire for instruction is remarkable and noteworthy.

Naturally enough the county could not produce enough Instructors, for handicrafts of all kinds are in great demand. A very satisfactory fortnight of classes to train Instructors was

therefore arranged and managed by the Handicrafts Committee last year. The training was of course very elementary, but a beginning was made, and this year it is proposed to hold more advanced classes. Before qualifying as Instructors, the students, after six months in which to practice, had to enter their work for the Dorset Arts and Crafts Exhibition and obtain the Association's Green Star of Merit; thereafter they could be placed on the county's list of qualified teachers. There are in the county what may safely be described as three real industries run by three different Institutes which make and supply articles either retail or for large orders—soft toys, dolls, and sun-bonnets. Many other industries are coming on well, but do not yet turn out their products in large numbers.

The Hants and Dorset Stall at the Royal Counties Show at Bournemouth realised £140 for the 27 Women's Institutes that contributed 1,127 exhibits from our county. Those who were in charge of the stall testify to its value as propaganda for the movement, many enquiries having been made and information given, so that it is hoped to hear soon of still more villages wanting Institutes. This would mean that our Organisation Committee would be overwhelmed with work; this committee not only starts an Institute but until the Institute is strong—usually for some three or four months—provides speakers on Institute work so that it may be thoroughly clear on all points. It is only when an Institute has been thoroughly well started that it can be expected to do well, and to thoroughness we owe the fact that we have a strong Federation in Dorset, all Institutes, since the formation of the Organisation Committee, having been well grounded before becoming federated.

The Federation Council—one Delegate from each Women's Institute—meets twice yearly, in the winter for the business meeting when the year's Executive is elected, and in the summer, when a speaker on some such subject as the drama, music, or handicrafts, visits us, and some of our Institutes give exhibitions of folk dancing, singing, and other forms of entertainment.

Between these gatherings, group meetings are held: there are four Groups in the county and much useful work is done through them. Any member of a Women's Institute may attend, and the meetings help to give an example of the value of co-operation and to keep the Institutes from becoming parochial. At them the members arrange for such things as a joint pageant, or a speaker's tour, and as the numbers attending are naturally smaller than at the County Federation meetings, much informal

and useful discussion takes place. Difficulties are reviewed and very often overcome by help or advice from someone present. Last winter the Executive Committee arranged a week of Group meetings at which discussions, opened by various members of the County Executive, were held on the whole movement, local and national, and on the duties of committees, President, Treasurer and Secretary.

Several Institutes have benefited very materially by the County Council cheese classes, and at all the principal shows in the county the Federation is offering prizes to its members for cheese, butter, eggs and trussed fowls. Through a Sub-Committee the Federation is endeavouring to establish simple co-operative schemes for dealing with all agricultural and horticultural matters. One Institute last autumn formed a horticultural committee of men and women and bought £120 worth of seed potatoes wholesale. Co-operation is probably a difficult subject for amateurs owing to the lack of brief published statements on the subject. Country people have done without co-operative schemes for many generations and do not wish to be troubled with deep reading or experiments. Interest may attach to the outstanding doings of a few Institutes. Several Institutes have formed clubs for coal, clothing, blankets, etc., while cycling and games clubs provide excellent forms of recreation for the younger members. One Institute has established a penny bank for the children; another has started a club room for all the women of the village and is doing very well. Outfits of various useful kinds are to be found in several, boot repairing lasts, sweeps' brushes, vacuum cleaners, etc., being shared by the members. Lectures by qualified persons on such subjects as the care of the sick, home nursing, and invalid cookery, the prevention of illness, care of the teeth, baby welfare, and so forth, are frequently given. Considerable interest is taken in the Education Act, and its provisions are now known in a number of villages where there are Institutes. A feature not to be overlooked is the help many Institutes have given with the starting of a Men's Club in their village; one Institute did so much that it was entertained by the Men's Club in appreciation of its efforts immediately the hall was erected!

For the benefit of those who do not know the inner working of Institutes it may be stated that every Institute is governed by its members; it is worked by everyone and not by a few, and the programmes, of which each member has a copy, are drawn up for six or twelve months by the elected committee from sugges-

tions made verbally or taken from slips which members post in the Institute's suggestion box. Items on the programmes are there by express wish of the members and not because an influential section thinks it "good" for the members to have lectures on certain subjects. Any programme, therefore, may be regarded as a mirror of the character, aspirations and level of education attained by each village with an Institute.

In dealing with Institutes in Dorset the movement and its progress have been considered as a whole; accounts of the everyday activities of Women's Institutes are commonly published in the local papers of nearly every county. Should details at any time be wanted, the headquarters, The National Federation of Women's Institutes at 26, Eccleston Street, S.W.1, will always be pleased to supply full particulars.

THE RASPBERRY GALL FLY.

(Lasioptera Rubi, Schrk.)

HERBERT W. MILES, N.D.A., Dip. Agr. Hons.
(Harper-Adams.)

THIS fly, which is one of the *Cecidomyiidae*, causes galls on the raspberry and blackberry, and is frequently met with in hedges and occasionally in plantations. Theobald (*Insect Pests of Fruit*, 1909), states: "It has seldom been brought to my notice as occurring in any amount on raspberries, and can scarcely be looked upon as a pest." In the Report on the Occurrence of Insect Pests, issued by the Board of Agriculture in 1918, the occurrence of abnormally large galls on the raspberry is mentioned, whilst in the Monthly Reports for January and February, 1921, issued by the Ministry of Agriculture, Theobald records



Galls on Raspberry Canes.

this pest as becoming increasingly injurious in Kent; it was also observed in Somerset during the winter of 1920-21, when the galls illustrated above were collected.

The galls on the canes are observed most readily after the leaves have fallen. They are located either at a node or in the internode, and measure from .59 in. to .79 in. ($\frac{1}{2}$ in. to $\frac{3}{4}$ in.) in length and up to .59 in. ($\frac{1}{2}$ in.) in width, and tend to be more regular in outline than the galls on the blackberry. If the galls

are opened they are found to be infested with numbers of larvæ, the usual number varying from fifteen to twenty, though as many as thirty have been recorded. The interior of the gall varies in colour from very dark blue to black, the centre being quite spongy in texture. The larvæ are readily seen, their orange-red colour making them very distinct against the dark interior.

The Larva is maggot-like and measures up to .1 in. ($\frac{1}{10}$ in.) in length at maturity. Feeding goes on through the late summer, autumn and winter. Where galled shoots were placed with their bases in water the larvæ became restless and commenced leaving the galls; they settled down quite normally, however, when the shoots were removed and placed in the soil, where the water supply was more in keeping with their natural requirements.

The Pupa is about .08 in. ($\frac{2}{25}$ in.) long and of the same colour as the larva. Pupation takes place in March and April in the galls, and before emergence the pupæ work themselves to the outside of the galls. After the exit of the flies the pupal cases may be seen protruding from one-half to three-quarters of their length out of the gall. Flies reared from galls kept at Long Ashton emerged between 13th April and the end of that month. Theobald, however, states that the flies hatch from May on into June. This difference is undoubtedly accounted for by the forcing effect of laboratory conditions.

The Adult is typical of the Cecidomyidæ. Its body, wings and limbs are covered with soft pubescence, and the dorsal surface of the abdomen is banded alternately with black and white, the pubescence on the ventral surface being uniformly black. The articulations of the wings and the coxal joints of the legs are yellowish in colour. The front of the thorax, which is almost hoodlike, is sparsely covered with rather coarse, almost bristle-like, greyish or yellowish down. The head is small and appears tucked under the thorax, and bears short, black antennæ, which are generally pointing downwards and forwards. The wing expanse is approximately .2 in. ($\frac{1}{5}$ in.).

Egg-Laying.—According to Theobald, egg-laying takes place in June, the eggs being deposited at the base of the buds and side shoots. They hatch in about eight days and give rise to larvæ which burrow into the rind and feed, setting up the irritation which results in the formation of the galls. The effect of infestation is a stunting of the canes, which may bear no fruit and few leaves.

Prevention and Remedy.—The fact that the galls can be seen in about six weeks after invasion by the larvæ suggests a simple method of dealing with this pest. A systematic search should be made through the plantations during autumn and early winter, and all galled canes should be cut off below the gall, and the prunings collected and burned, thus effectively destroying the larvæ.

As this gall fly also attacks the bramble, all blackberry bushes in hedges or in clumps near plantations should be cut back, and if it is definitely known that they are the source of infestation they should be destroyed by burning. In this way the pest can be satisfactorily controlled and plantations kept practically free from invasion.

THIRD INTERNATIONAL CONGRESS ON SEED TESTING AT COPENHAGEN.

C. B. SAUNDERS.

Director of the Official Seed Testing Station.

THE following notes on the Third International Seed Testing Conference are complementary to the account published in the July number of this *Journal* (p. 296).

The two previous meetings of the Congress were held at Hamburg (1906) and at Wageningen (1910). The third Congress was the outcome of a suggestion that the jubilee of the Danish Official Seed Testing Station would be a suitable occasion for another conference.

Invitations were sent by the Danish Government to the different countries possessing Official Seed Testing Stations, with the result that about thirty delegates were sent by the following countries:—Belgium, Canada, Czecho-Slovakia, Denmark, Finland, France, Germany, Great Britain, Holland, Hungary, Norway, Poland, Rumania, Servia, Sweden and Switzerland.

The Congress was held under the chairmanship of Professor Dr. W. Johannsen, who is the Chairman of the Danish State Seed Testing Board. The success of the meetings was largely due to Dr. Johannsen's personality and also to his ability to give a précis of any paper in almost any European language.

Papers were read during the week by the following gentlemen, and in most cases were followed by open discussion.

Mr. F. F. Bruijning (Holland): "General Views concerning International Unification of Methods of Seed Testing in the Interest of Trade, more especially with regard to the Purity of Seeds."

Dr. Volkart (Switzerland): "Determinations of the Provenance of Seeds."

Sir Lawrence Weaver: (a) "The Seeds Act, 1920."

(b) "The National Institute of Agricultural Botany."

Mr. C. B. Saunders: "Methods of Seed Testing in the United Kingdom."

Dr. Edgar Brown (America) (by proxy): "Seed Testing in the United States."

Mr. G. H. Clark (Canada): "Seed Control in Canada."

Prof. Dr. Voigt (Germany): "Investigations on the Germination of Grass, Clover, and other Small Grained Seeds."

Mr. L. Kommers (Germany) (by proxy): "Analysis of the Seed of the Beet Family."

Mr. J. Widen (Sweden): "Investigations on the Content of Water and on the Germination of Cereals."

Mr. Dorph-Petersen (Denmark) : "Report on the Investigations made by the State Seed Testing Stations, both in the Laboratory and in the Field, upon the Germinating Energy, Purity of Strain, and Freedom from Disease of Seed."

Mr. E. Vitek (Czecho-Slovakia) : "The Determination of Dodder."

Dr. von Degen (Hungary) and M. Bussard (France) : "Plans for the Unification of Seed Testing Methods."

Mr. Bruijning's paper was mainly concerned with a discussion of the various methods of making purity determinations. He pointed out the desirability, more particularly from the point of view of the seed trade, of standardising the methods by which such tests are made. A suggestion made for "grading" seeds according to a formula somewhat similar to the "real value" formula did not receive much support. Attention was also drawn to the question of "sprouted" seed. Mr. Bruijning pointed out that in many cases, particularly with cereals, "sprouted" seed was capable of making a satisfactory second growth, but the general feeling of the Congress appeared to be that it was desirable to look upon "sprouted" seed as an impurity.

Dr. Volkart dealt with the use of "character seeds" as a means of identifying the country of origin of the sample. He also pointed out that other impurities, such as earth, snail-shells, and other forms of inert matter were also of value in certain cases. It was suggested that one of the Official Seed Testing Stations should be asked to correlate all the available information on this subject, and also to collect further data from different parts of the world. At the request of the Congress Dr. Volkart undertook to do this work at Zürich.

The next four papers dealt mainly with methods of Seed Testing and Seed Control in different countries.

Sir Lawrence Weaver described the steps that led up to the passing of the Seeds Act and to the formation of the National Institute of Agricultural Botany. Mr. Saunders gave a summary of the Seeds Act Regulations and a brief description of the methods of testing used in the United Kingdom. Apart from the difference between the "Irish" and "Continental" methods of grass seed testing there is not much variation in technical details. In one point of routine work, however, the English Station appears to have gone further than the Continental Stations. Here the work is divided into four sections—Clovers, Grasses, Cereals, Roots and Vegetables—each having its own purity and germination rooms, whereas most of the Continental Stations do not make this differentiation. The English method would appear to have many advantages.

Dr. Voigt's paper was a plea for uniformity in methods of making germination tests, and the Congress accepted a number of general directions for use in making germination tests. These matters and also those raised by Mr. Bruijning were referred to the sub-committee mentioned in the note in the July issue of this *Journal*.

Mr. Widen's paper gave rise to a very useful discussion upon the difficulties that arise in connection with the germination of cereals immediately after harvest. Various forms of artificial stimulus were described, such as drying, freezing, clipping and so forth. The general opinion was that such methods were justifiable in that they gave a better impression of the agricultural value of the seed, but that in reporting such germination figures to the sender, the fact that some form of pre-germination treatment had been used should be noted.

Mr. Dorph-Petersen described the field tests which are being made by the Danish Official Seed Testing Station in connection with purity of strain and freedom from disease. Special attention so far has been given to barley and its associated diseases, particularly *Pleospora graminea*.

Mr. Vitek opened a discussion upon the occurrence of dodder in Southern Europe, and great interest was created by a demonstration by Dr. von Degen of a possible new method for the removal of dodder seed from clover. This is based upon the difference in the elasticity of the seed coats of the two kinds of seed, and can be demonstrated very simply. If red clover and dodder seeds are dropped one by one from a height of about eighteen inches into an ordinary saucer, it will be found that the red clover seeds almost all bounce out of the saucer, whereas the dodder seeds, being less resilient, remain in the saucer. So far, however, owing to various practical difficulties it has been found impossible to evolve a machine based on this principle.

The last paper on the list was an echo of the previous Congress, and the questions raised were submitted to the sub-committee.

NOTES ON FEEDING STUFFS FOR SEPTEMBER.

E. T. HALNAN, M.A., Dip. Agric. (Cantab.).

Ministry of Agriculture and Fisheries.

IF the experience of past dry years repeats itself, the break in the dry weather will be followed by a luxuriant lushy growth of grass in the pastures, and the cattle will show a tendency to scour. This tendency can be corrected by the addition of a little cotton cake.

Oats have been an extraordinarily cheap feeding stuff, so much so that they have compared favourably with other concentrated feeding stuffs, and it has paid the farmer to buy in oats as a feed for his stock in preference to other feeding stuffs. It may be of interest here to emphasise the fact that, when conditions of price allow its use, a mixture of oats and linseed cake, half-and-half, forms one of the best feeds for the production of milk of which the writer is aware.

Home-grown Feeding Stuff: the Future.—The unfavourable climatic conditions of this season will almost certainly result in a general shortage of home-grown food for stock in the spring and early summer of 1922. The hay crop has been got in under very favourable conditions, and has resulted in a light but very good quality hay. In some districts straw is also short, and owing to the dry weather, roots are also likely to be short except on a few well-favoured farms. In order to compensate for this possible shortage of food, it will be wise to reserve a break for the growth of a forage crop to come into use at the time that the question of feed will most likely be a problem. A vetches and oats mixture and winter cabbages may be suggested as suitable crops for this purpose.

Sweet Clover as a Forage Crop.—The attention of the writer has been called to the value of sweet clover (*Melilotus alba*) as a forage crop. In England its use has hitherto been confined to ploughing in as a green manure, but Canadian experience has established it firmly as an efficient substitute for clover in the rotation. In feeding value it is approximately equal to clover, and since it yields 5 tons of hay to the acre, it is too valuable a

NAME.	Price.		Price per Ton.		Manurial Value per Ton.		Food Value per Ton.		Starch Equiv. per 100 lb.		Price per Unit, Starch Equiv.		Price per lb. Starch Equiv.	
	s.	lb.	£	s.	£	s.	£	s.			s.		d.	
Barley, English Feeding	45/6	400	12	15	1	6	11	9	71	3/3		1	74	
" Canadian "	49/-	400	13	14	1	6	12	8	71	3/6		1	87	
Oats, English "	39/-	336	13	0	1	9	11	11	59.5	3/10		2	05	
" Foreign "	34/6	320	12	1	1	9	10	12	59.5	3/7		1	92	
Maize, Argentine	48/6	480	11	6	1	5	10	1	81	2/6		1	34	
Beans, English spring	—	—	—	—	—	—	—	—	—	—		—	—	
" " winter	55/6	532	11	14	3	1	8	13	66	2/7		1	38	
" Rangoon "	12/-	112	12	0*	3	1	8	19	66	2/8		1	43	
Peas, English blue	60/-	504	13	7	2	13	10	14	69	3/1		1	65	
" " dun	75/-	504	16	13	2	13	14	0	69	4/1		2	19	
" " maple	92/6	504	20	11	2	13	17	18	69	5/2		2	77	
Buckwheat	—	—	—	—	—	—	—	—	—	—		—	—	
Rye, English	57/3	480	13	7	1	8	11	19	72	3/4		1	78	
Millers' offals—Bran	—	—	10	0	2	10	7	10	45	3/4		1	78	
" " Coarse middlings	—	—	15	15	2	10	13	5	64	4/2		2	23	
Barley meal	—	—	16	5	1	6	14	19	71	4/2		2	23	
Maize " "	—	—	12	12	1	5	11	7	81	2/10		1	52	
Fish " "	—	—	19	0	7	12	11	8	53	4/4		2	32	
Linseed " "	—	—	24	10	2	16	21	14	119	3/8		1	96	
" Cake, English	—	—	17	9	3	12	13	17	74	3/9		2	01	
Cottonseed, " "	—	—	11	15	3	5	8	10	42	4/-		2	14	
" " decorticated	—	—	15	10*	5	6	10	4	71	2/10		1	52	
" Meal, decorticated	—	—	15	15*	5	6	10	9	71	2/11		1	56	
Coconut cake	—	—	12	15	3	0	9	15	79	2/6		1	34	
Groundnut cake	—	—	—	—	—	—	—	—	—	—		—	—	
Palm kernel cake	—	—	10	15*	2	1	8	14	75	2/4		1	25	
Brewers' grains, dried, ale	—	—	9	15	2	7	7	8	49	3/-		1	61	
" " wet "	—	—	1	13	0	12	1	1	15	1/5		0	76	
Distillers' " dried	—	—	9	7*	2	16	6	11	57	2/3		1	20	
Malt culms	—	—	8	0	3	6	4	14	43	2/2		1	16	
Potatoes†	—	—	2	13	0	8	2	5	18	2/6		1	34	
Swedes†	—	—	1	2	0	5	0	17	7	2/6		1	34	
Mangolds†	—	—	1	1	0	6	0	15	6	2/6		1	34	
Vetch and Oat Silage†	—	—	2	10	0	15	1	15	14	2/6		1	34	

* Prices at Liverpool.

† Farm value.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of July and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative prices of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, suppose palm kernel cake is offered locally at £10 per ton. Its manurial value is £2 1s. per ton. The food value per ton is therefore £7 19s. per ton. Dividing this figure by 75, the starch equivalent of palm kernel cake as given in the table, the cost per unit of starch equivalent is 2s. 1d. Dividing this again by 22.4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 1.11d. A similar calculation will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own market.

fodder crop to neglect, if stock can be got to like it. English experience has rejected the use of this crop in the past owing to the presence of a bitter principle "cumarin," which is chiefly present in the stems. The chief point in cutting or grazing this crop is therefore to cut the crop before it gets too woody. If the stock are turned on to this feeding stuff early in the spring before other green stuff is available they will soon learn to relish it. Owing to its erect habit of growth, sweet clover would probably be a suitable crop to sow with vetches as a supporting crop.

THERE has been a steady decline in the prices of nearly all fertilisers during the past few months. In no case has the drop

**Prices of
Fertilisers.**

been more marked than in that of *sulphate of ammonia*, the price of which has almost fallen to pre-war level. For sulphate containing $25\frac{3}{4}$ per cent. of ammonia (neutral quality) the price for May delivery was £26 0s. 6d. per ton as compared with the present price of £14 6s. For $25\frac{1}{4}$ per cent. ammonia (ordinary quality) the May price was £25 2s., and for $24\frac{3}{4}$ per cent., £24 11s.; these prices have now dropped to £13 3s. and £12 17s. respectively. A noticeable feature of the export market for sulphate of ammonia is the revival of the trade with Japan, which for a considerable period was practically dormant.

While the prices for the higher grades of *basic slag* are practically at the same level as in May, the prices of the lower grades, for which the demand is much smaller, have fallen considerably, basic slag of the 20-22 per cent. grade being now sold at 80s. per ton instead of 113s. 6d., which was the price for May delivery.

Superphosphate also shows a decline in price, being now sold at £5 15s. per ton for 30 per cent. superphosphate as against £8 5s. in June. Owing principally to the cheaper supplies obtainable in other countries, the export market for superphosphate has fallen off considerably, thus leaving large stocks in hand to meet home requirements.

Nitrate of soda has fallen from a May price of £19 7s. 6d. per ton to £18 10s. at the present time.

In keeping with the general fall in prices, both French and German *potash salts* may now be obtained at almost half the prices ruling last March. The prices mentioned above naturally vary somewhat in different districts, and apply only to substantial quantities, i.e., 2 or 4 ton lots, usually free on rail.

DURING the past few months there has been a notable fall in the market values of practically all descriptions of live stock.

The Fall in Live Stock Prices.

The decontrol of fat stock at the beginning of July, 1920, was followed by an immediate and substantial advance in prices, and although a reaction set in almost at once, throughout the year prices for the better grades of cattle, and for all descriptions of sheep, remained considerably higher than those which had been in force under control. Fat cattle normally decline in value between July and October, and 1920 was no exception to this rule, but the Christmas demand forced prices up to a higher point than had been reached at any time previously, and although a slight decline set in subsequently, the December level of prices was fairly well maintained up to the end of April. Fat sheep showed a steady advance in price, after the first violent fluctuations succeeding decontrol; this advance was checked in December, probably owing to the Christmas demand for beef in preference to mutton, but trade in the best quality fat sheep recovered during January, although the lower grades continued the slight downward movement commenced at the end of November. During the first four months of 1921 fat sheep steadily declined in value, the decline being no doubt due in some measure to the continuous fall in the market value of wool.

Table I shows the average market prices of fat cattle and sheep under control and during January and April of this year.

TABLE I.

Average Market Prices of Fat Cattle and Sheep in certain months of 1920 and 1921.

	June, 1920.		January, 1921.		April, 1921.	
<i>Fat Cattle</i> (per live cwt.)—	s.	d.	s.	d.	s.	d.
1st Quality	95	0	105	9	104	9
3rd Quality	85	0	85	0	82	9
<i>Fat Cows</i>	90	0	93	3	90	9
<i>Fat Sheep</i> (per lb.)—						
1st Quality	1	6½*	2	2†	2	0½†
3rd Quality	1	6½*	1	8½†	1	5½†

* Shorn.

† In wool.

Since the beginning of May the decline has been much more rapid and became accelerated during July, although a slight recovery has been noticeable during recent weeks. Table II shows the average market prices of fat cattle and sheep during the fifteen weeks up to the week ending August 17th.

TABLE II.

Weekly average Market Prices of Fat Cattle and Sheep, 1921.

Week ending	Fat Cattle (per live cwt.).			Fat Sheep (shorn) per lb.	
	1st Qual.	3rd Qual.	Cows.	1st Qual.	3rd Qual.
	s. d.	s. d.	s. d.	d.	d.
11th May ...	101 9	81 0	87 9	20 $\frac{1}{2}$	15
18th " ...	101 9	78 6	88 3	20 $\frac{3}{4}$	15 $\frac{1}{4}$
25th " ...	101 6	76 6	87 9	20 $\frac{3}{4}$	14 $\frac{1}{2}$
1st June ...	98 6	75 0	83 3	21	15 $\frac{1}{4}$
8th " ...	95 9	72 0	81 6	20 $\frac{1}{4}$	14 $\frac{1}{4}$
15th " ...	95 9	71 6	81 0	19 $\frac{3}{4}$	14 $\frac{1}{4}$
22nd " ...	93 6	69 9	78 0	18 $\frac{3}{4}$	13 $\frac{1}{4}$
29th " ...	88 6	66 6	73 0	18 $\frac{1}{4}$	12 $\frac{3}{4}$
6th July ...	87 9	67 3	73 3	18	12 $\frac{1}{2}$
13th " ...	83 0	61 0	66 3	16 $\frac{3}{4}$	11 $\frac{1}{4}$
20th " ...	79 6	59 0	63 6	16 $\frac{1}{4}$	11
27th " ...	82 0	60 6	65 0	16 $\frac{3}{4}$	11 $\frac{1}{2}$
3rd August ...	83 0	63 3	66 9	17	11 $\frac{3}{4}$
10th " ...	85 0	61 3	67 9	17 $\frac{3}{4}$	12
17th " ...	84 0	62 3	67 3	17	11 $\frac{1}{2}$

Since April fat cattle have thus fallen by 20 to 26 per cent., while sheep have declined 18 to 23 per cent. compared with May, when shorn sheep were first marketed in appreciable numbers. Many factors have no doubt contributed towards this decline. A slight fall in prices is a normal feature of this season of the year, but it is not usually sufficiently noticeable to attract attention, and has probably been accentuated this year by the abnormal conditions that have obtained, industrially and climatically, during the past few months. The continued drought and consequent lack of keep have resulted in larger numbers of fat stock being marketed than is normally the case at this season of the year, and many of the animals sent into the markets have been in only a partly finished condition. Add to this the reduced demand consequent upon a long spell of hot weather, and an abnormal amount of unemployment, and there is no cause for wonder that trade and prices have been seriously disturbed.

These factors, however, are not sufficient in themselves to account altogether for the heavy decline in prices which has occurred. The primary cause of the fall is more probably the general decline in wholesale prices which has recently become apparent, and which has already been reflected in the market values of other agricultural produce. Table III shows the index numbers of wholesale prices during the past year, as given in the *Statist* newspaper (expressed as percentages of the index number for 1913), together with the index numbers of agricultural prices during the same period and those of the cost of living prepared by the Ministry of Labour.

TABLE III.
Index Numbers of Prices.

Month.			Statist Whole- sale Prices* (1913 = 100).	Cost of Living* (June, 1914 = 100).	Agricultural Produce† (1911-13 = 100).
July,	1920	...	299	255	274
August	"	...	298	261	277
September	"	...	293	264	281
October	"	...	282	276	291
November	"	...	263	269	297
December	"	...	244	265	294
January,	1921	...	230	251	286
February	"	...	215	241	272
March	"	...	208	233	258
April	"	...	200	228	241
May	"	...	191	219	212
June	"	...	183	219	202
July	"	...	186	222	200

*End of month prices.

†Monthly average prices.

Wholesale prices have thus fallen by nearly 40 per cent. since July last year, while agricultural produce of all kinds, which had in November risen to a point 197 per cent. above the pre-war level, has since fallen to 141 per cent. in April and 100 per cent. in July, above the average for 1911-13. The reduction in fat stock values may therefore be set down to a general re-adjustment of prices rather than to any other cause, and bearing in mind the extent to which other produce has fallen, it is matter for comment rather that prices of live stock were maintained for so long than that they have now commenced to fall.

* * * * *

In order to secure the full discussion of the manifold and complex problems with which breeders and growers of potatoes are confronted, the Ministry and the Royal Horticultural Society have arranged to hold jointly an International Potato Conference in London from 16th to 18th November next, at the Royal Horticultural Society's Hall, Vincent Square. During the progress of the Conference the National Potato Society will hold its Annual Show in the Hall, and most British varieties of potatoes will be exhibited. In addition an exhibit dealing with the scientific aspect is being arranged, and it is hoped that workers engaged on potato problems in all parts of the world will co-operate.

Invitations to the Conference have been extended by His Majesty's Government to the Governments of the Dominions and Colonies, and of Foreign Countries, and it is hoped that it will be a representative gathering of all those interested in the

question, whether from the scientific or commercial point of view. Arrangements for the Conference are being made under the direction of a Committee constituted as follows :—

Chairman—LORD LAMBOURNE, C.V.O., Royal Horticultural Society.

Vice-Chairman—SIR DANIEL HALL, K.C.B., Ministry of Agriculture.

F. J. CHITTENDEN

W. CUTHBERTSON

C. G. A. NIX

MARTIN H. SUTTON

A. D. COTTON

P. G. DALLINGER

W. G. LOBJOIT

} Royal Horticultural Society.

} Ministry of Agriculture.

JAMES WOOD, Board of Agriculture for Scotland.

J. R. CAMPBELL, Department of Agriculture, Ireland.

WILFRED PARKER, National Institute of Agricultural Botany.

J. R. POAD

W. H. MORTER

} National Potato Society.

Joint } W. R. DYKES, Royal Horticultural Society.

Secretaries } H. V. TAYLOR, Ministry of Agriculture.

The programme of the Conference covers the breeding and selection of potatoes, industrial and commercial uses, the potato industry, and various diseases to which potatoes are subject.

* * * * *

ISSUED by the Ministry as Miscellaneous Publication No. 30, Professor Somerville's latest summary of the experiments con-

Manuring for Meat and Milk.

ducted for the improvement of pasture, links together in a simple and most interesting fashion the results obtained from a wide number of centres. The oldest of these, Cockle Park, has had its experiments in existence for about a quarter of a century. The variety of conditions and soils, together with the periods during which the various tests have been conducted, add to the value of the results. The experiments were commenced at a time when basic slag was beginning to command attention as a means of improving pastures. From the commencement of the trials it has been compared with lime, bones, and superphosphate—traditional dressings twenty-five years ago. There was, and still is, the belief that cake must be fed if, on much of our grass-land, stock are to be properly finished. All these methods were included in the experiments from the first, together with tests of phosphates with potash on the one hand, and with nitrogen on the other. The original trials commenced on such lines, and many centres have duplicated them, wholly or in part, while tests at other centres also help to furnish the conclusions arrived at by Professor Somerville

It is clear that phosphates are the foundation of all improvement of pasture in this country. Their effect is now well known amongst farmers. They stimulate the clovers and other *Leguminosæ*. A season or two after the application of basic slag, a poor pasture is commonly found to be a carpet of clover. Leguminous plants are nitrogen-collectors, and the result is that the soil is enriched and the grasses in turn are nourished to a new luxuriance. The improvement is continued in the increase of the better pasture grasses, and the suppression of coarser and inferior plants, whether grasses or weeds.

Of the phosphatic manures, slag has proved superior to superphosphate or dissolved bones. Professor Somerville is of opinion that precipitated phosphate and raw mineral phosphates ground very fine are worth trying. Much of our poorer pasture land is sour or acid, and the growth of clovers is stunted. Their development, as has been shown, is an essential step in the advance towards improvement. On account of its alkaline character, slag tends to counteract soil acidity, whereas superphosphate is acid and therefore likely to intensify the trouble. Superphosphate with lime is often mentioned as an alternative to slag. They have been tested side by side. In the first nine years of the Cockle Park tests the total liveweight increases resulting from the two dressings approximated very closely, but the net gain each year, after the manures had been paid for, showed a bigger balance from the plot treated with slag.

Lime alone does not appear to be an important agent in the improvement of all pastures. At three centres, as widely apart as Northumberland, Northamptonshire and Hampshire, its use alone continued to show a loss even after eight years. Its value is on pastures with a tough fibrous top, which it breaks down, and so prepares the way for phosphates. The condition of such pastures may be due to situation or may result from unsuitable manuring. Potash seems to be necessary in only very few instances, but nitrogen applied in any form is most unsuitable. One way in which nitrogen may thus be brought to the pasture is in feeding cake to the stock. Professor Somerville shows that cake alone gives a disappointing return both directly in the liveweight increases due to its use, and indirectly when an improvement consequent on the manurial residues is looked for. With regard to caking stock on slagged pasture he says: "The worst possible conditions for the use of cake are when it is supplied to animals grazing land which itself has been improved by slag."

Slag may be applied to pasture at any time of year. The practical advantages of summer dressing are evident in the matter of carting, labour, and calm days for drilling. The effect is lasting, but fertility should be maintained at a high level by further doses at periods of three or four years. Nothing so striking as the first improvement is likely to be observed after subsequent dressings, but the standard of fertility being higher, contrast cannot be so obvious. Slag prolongs the grazing season. The presence of clovers is necessary, as they are an essential link in the chain of improvement. Where they are absent or almost so, wild white clover seed should be sown, and Professor Somerville urges farmers to grow their own. It is interesting to see confirmed the natural conclusion that if slag results in live weight increase it will also affect greater yields of milk.

The application of nitrogen, it is insisted, is bad for pasture. The reason for this is that it encourages the growth of coarse grasses and weeds which in turn crowd out the finer herbage. The latter is more palatable and of higher feeding value. Nitrogen thus applied depresses clovers. The whole series of results is the opposite to that brought about by phosphates. In respect of these facts, meadowland is broadly the same as pasture. That quantity is not the same as quality in meadow hay is clearly brought out by the figures given. The influence of potash is worth noting. In the experiments quoted it actually reduced the yield when used alone, whereas applied along with phosphates it considerably improved the quality of the hay.

* * * * *

It has come to the Ministry's notice that a certain amount of imported honey at present on the English market is of a quality inferior to that produced in this country.

**Labelling
English Honey.**

Some of it has been used for bee-feeding during the winter months, with very unsatisfactory results. Apart from this aspect of the matter, consumers of honey should support home industry by asking for English honey, and thus not only stimulate the production of this valuable food commodity, but also induce producers to use a distinctive label showing that the honey is home-produced. Such labels are now being issued by most County Bee-Keepers' Associations to members who ask for them, but many do not yet fully recognise their value. This is, perhaps, not to be wondered at, since bee-keepers are primarily producers and not salesmen. The labels used by some County Associations state that complaints as to the quality of the honey should be

made to the Associations. As a matter of fact, an Association, by the issue of a label, does, in effect, guarantee the contents of the jar or section of comb-honey on which the label is used as "pure English honey," and if the contents were found to be not of that description, severe steps would no doubt be taken by the Association against the offender.

The Ministry advises all members of Associations to take full advantage of the issue of labels and to use them in presenting their supplies to public or private customers. The use of the label should also ensure that English produce is kept up to a high standard. There are at the present time no powers under the Merchandise Marks Act which enables the Government to insist on the marking of imported honey as such and as coming from a stated country.

* * * * *

THE Ministry has been active in arranging a series of lectures on, and in bringing about demonstrations of, the methods of improving grasslands over the country.

Improvement of Grassland.

The County Agricultural Education Authorities and the Agricultural Colleges have readily come to the Ministry's assistance, and at some 339 centres in England demonstrations are now going on. The Ministry is publishing a series of County guides to the demonstrations, and those for Derbyshire, Shropshire, Kent, East Sussex, Wiltshire, Lindsey, Kesteven, Surrey, Somerset, Notts, Cornwall, Stafford, Gloucester, Warwick, East Suffolk, Northampton, Buckingham, Leicester and Dorset have already been issued. Copies may be had in each case from the Agricultural Organiser of the county concerned. His address is usually the County Council Offices. Guides to demonstrations in Cheshire, Cumberland and Westmorland, Yorkshire and Rutland are now in preparation. All farmers interested in the matter should get their County guide and visit the demonstrations nearest to their holding. They will find that a personal inquiry into the ways and means of improvement will be of very great value indeed, in many cases, in helping them to improve their meadow and pasture land. In the present season lectures are being held throughout the country by Professor Gilchrist, of Armstrong College, by Dr. J. Hanley, of Leeds University, and by Professor Stapledon and Mr. T. J. Jenkin, of University College of Wales, Aberystwyth.

In June, 1921, there were in England and Wales no fewer than 14½ million acres of permanent grass and 11½ million acres of

arable land, of which $2\frac{1}{2}$ million were under temporary grasses (clovers, sainfoin, and rotation grasses) and in addition there were $4\frac{1}{2}$ million acres of mountain and heath land used for grazing. The total acreage of grassland of one kind or another in England and Wales in June, 1921, was, therefore, about $21\frac{1}{2}$ million acres, compared with about 9 million acres under other crops. It is, however, not merely the extent of the grassland that renders attention to the matter urgent. There is the very important additional consideration that a large proportion of it is of very poor character and capable of considerable improvement. Farmers in general are making much more use of improved methods of growing ordinary crops than of those of cultivating grasses. The grasslands are therefore getting very much behind in farming economy, and farmers should consider how improvement as exemplified by the demonstrations can best be effected. There are cases where the produce of grassland has been trebled and quadrupled, and in one experiment (at Cockle Park, Northumberland), by suitable treatment the produce has been raised from 20 lb. of lean meat per acre per annum to 105 lb., giving more than a five-fold increase in value. There is doubtless much still remaining to be learnt by the instructors on the subject, and much research has still to be made, but there is also much knowledge which has already been accumulated and which should be known without further delay by all sections of the farming community.

* * * * *

ATTENTION is particularly directed to three matters in connection with seeds administration which will affect the working arrangements of seed merchants.

**New Seeds
Regulations.**

a.—The first and most important is the provision in the Seeds Regulations, 1921,* which has a bearing on the validity of certificates issued by an Official Seed Testing Station or by a licensed station. Under Regulation (5) a test on which a declaration is to be based *must* be made upon a sample of a certain weight. A test made on an underweight sample will not be valid for this purpose.

It has been decided that in all cases where a sample of less than the scheduled weight is received by the Official Seed Testing Station, the sender shall be required to forward a *fresh full-weight sample*, unless the original underweight sample is accompanied by a statement that the certificate is not required for sale

* See this *Journal*, Vol. XXVIII., p. 370.

purposes. It was felt that this course would be preferable to the alternative of issuing a certificate which would be valueless for commercial purposes and which would carry no legal weight.

In practice, samples will be weighed immediately they are received at the Official Seed Testing Station, and senders of underweight samples, in the absence of the above-mentioned statement, will be advised by letter that fresh samples of full weight are required. The station will not undertake to mix two underweight samples to make one sample of full weight, but will return the original underweight sample on request.

b.—The second point is that the Official Seed Testing Station will be transferred to Cambridge early in September, and that after the date of transfer, of which notification will be given in the Press, samples should be addressed to the Official Seed Testing Station for England and Wales, Huntingdon Road, Cambridge.

c.—The third point is that from the date of transfer of the station to Cambridge, the privilege of franked correspondence will be withdrawn. All letters, parcels of samples, etc., posted to the station at Cambridge must be fully stamped or they will be liable to miscarry. It is hoped that particular attention will be paid to this point, as otherwise much inconvenience may arise from delay or loss of letters and samples.

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With the object of giving the public a general idea of the possibilities of goat keeping as an industry and as a profitable branch of small holding work, the West Surrey Goat Club held their third annual show at Stoke Park, Guildford, at the end of May. There were no fewer than 23 classes, with an average of about eight goats in each class, while 28 different breeders entered exhibits. Most of the breeds in this country were represented, among them being the British Alpine, British Saanen, Anglo-Nubian, Swiss, Toggenburg and British Toggenburg. M. T. W. Palmer, Secretary of the British Goat Society, was the judge. The goats were of remarkably good quality and included many excellent milkers, one of which had given on the day of the show over 8 lb. of milk. Miss McLeod, County Dairy Demonstrator, lectured on butter and cheese making from goats' milk and gave working demonstrations. Model goat houses and dairy and stable appliances were also on view.

One of the features of the show was Mrs. Lacy-Hulbert's exhibition of fur-bearing rabbits, as well as cured skins of kids,

goats and rabbits, and a wide variety of articles made therefrom, ranging from gloves to white beaver coats for children. It would appear that, if properly handled, there should be a profit in the production of good rabbit pelts.

The West Surrey Goat Club have also arranged goat classes at various agricultural shows taking place during the season in the district. Among other goat shows held this season was that of the Sussex County Goat Club, which took place in May in conjunction with the Sussex County Agricultural Society's Show.

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A BRIEF account of the Fairford and Cirencester Egg Depot, Limited, a successful Society for the collection and sale of eggs,

**A Successful
Egg-Collecting
Society.**

may be of interest to those engaged in the poultry industry. There is considerable scope for the development of the idea that poultry-keepers working in co-operation can supply markets in a way which is much more profitable to the individual than if he tried to do his business alone.

The advantages which this enterprising Society lays before its members may be summed up as follows :—(1) An efficient motor-collecting service; (2) No expense of marketing; (3) Large or small quantities of eggs accepted; (4) Payment for eggs, at the best possible price obtainable, made in cash either monthly or quarterly; (5) Profits distributed amongst members; (6) Free advice on ailments of poultry.

The Society was established in 1901 and since 1904 has made profits every year and increased its egg sale until it now reaches over a million annually. The Society has contracts to supply eggs to several large hospitals and also to His Majesty the King.

It is no part of the Society's aim to make large profits. These are kept as low as possible, the aim being to get as high a price for the members' eggs as can be got. This price is decided each week by the manageress after careful scrutiny of the markets and the relevant information. As the price is fixed for the whole week, great care and circumspection are necessary, and, if good judgment is not used, large sums can easily be lost. A great point with the Society is never to refuse to take eggs from its members, even in times of glut. When these occur, and the Society has more eggs than it has a clear demand for, it does not preserve any eggs, its policy being against that course on the view that preservation does not really pay owing to foreign competition. At such times, the Society finds that its regular

customers will help it out by taking as many eggs as possible, and to such customers the Society reciprocates by supplying them first with eggs during a shortage.

The Society pays carriage on all eggs dispatched, though this gives them the trouble of making any necessary claims to the railway companies for loss or damage. It finds, too, that it is safer and cheaper to send eggs by goods' train at owner's risk. When this is done, the railway companies more readily listen to claims for theft or damage than when the eggs are consigned by passenger train.

Recently, the Society has been much concerned on account of the excessive number of undersized and dirty eggs received and has issued a notice to its members calling their attention to this fact, and informing them that in future 3d. per dozen less than the price quoted as the price for the week will be paid for dirty eggs and for eggs under $1\frac{3}{4}$ oz. weight. The notice points out that foreign eggs of large size and excellent quality are coming into the country, and that the Society can only maintain its place in the market if its members keep the best stock and manage their poultry in the most approved fashion. The Society is ready to give its members free expert advice on any question concerning stock, particularly in those cases where deterioration of stock and eggs has occurred. The example of this pioneer Society might well be followed in other rural communities.

AGRICULTURE ABROAD.

It is fully recognised by many Canadian farmers that the milking herds of the country can be much improved by means of milk records. The information obtained from the records is applied in two ways: (1) to the elimination of the poorer animals from the herds, and (2) to the selection of pure-bred dairy bulls possessing inherited dairy qualities of a high order for use in the herds.

Milk Recording in Canada.

Mr. A. H. White, the senior dairy promoter attached to the Dominion Department of Agriculture at Ottawa, reports that a brief analysis of the records of most of the Ontario herds shows that even in the better of them there are nearly always one or two poor cows, and that where there is no systematic effort to grade-up the herd, it is not uncommon to find one-quarter of the animals not even paying for their feed. In one instance of 540 cows recorded, the average production for 1920 was 7,094 lb. of milk and 248.8 lb. of fat, against an estimated average production in Ontario of about 4,000 lb. of milk. The best record was of a cow which produced 14,160 lb. of milk and 545.6 lb. of fat, and the poorest yield was 1,595 lb. of milk and 79.9 lb. of fat. This is an astonishing difference. Further analysing these records, Mr. White points out that the best 135 cows produced more than twice the amount of milk and fat than the poorest 135 cows, though the latter yield was about equal to the estimated average production of all the dairy cows in Ontario. These figures make it clear what latitude there is for improvement. It should be remembered that all increased production is practically net profit, because a poor cow requires the same amount of food and attention as a first-class one. The total number of cows recorded in Canada in 1920 was 33,382 in 3,847 herds at 564 centres. This shows an increase of nearly 50 per cent. on the number tested in the previous year, so that the practice of milk-recording is growing very rapidly in Canada. It appeals to the Canadian dairy farmer as a certain money maker, and it is safe to predict that none will give it up. Its immediate success is attributed very largely to the enthusiasm of the Canadian Government dairy instructors. In addition to this work, instructors supply milk record forms to farmers who are too far from an organised centre to have samples of milk tested regularly for butter fat. Thus these farmers may keep their own figures.

A case is cited in a recent issue of *The Agricultural Gazette of*

Canada of an Ontario dairyman who started 12 years ago with a common herd of cows each producing only about 5,000 lb. of milk per annum. By careful selection and a ruthless weeding-out of poor cows, he possessed last year a herd whose produce averaged more than double that weight of first-class milk. Three of his cows each produced more than 13,000 lb. of milk and 460 lb. of fat.

It is impossible to emphasise too strongly the importance of milk records in the selection of the best strains of milking cows for the production of the best dairy sires. Many a bull calf looks very promising, but it is impossible to judge its value as a potential factor in a milk herd without figures of the milking properties on both sides of its ancestry.

* * * * *

PARTICULARS of a successful experiment, which has been in progress since 1919, to improve the native fowl in Northern Nigeria by crossing them with pure breeds imported from England, are supplied by Mr. P. H. Lamb, Director of Agriculture for the Northern Provinces of that country.

**Improving the
Native Fowl in
Northern Nigeria.**

Through Mr. P. Hedworth Foulkes, Principal of Harper Adams Agricultural College, Newport, Salop, two cockerels and six pullets of each of the following breeds were obtained:—Indian Game, Light Sussex and Rhode Island Reds. The cockerels were not related to the pullets or to one another, for the future introduction of fresh, pure blood would be difficult. Two of the Light Sussex died on the voyage: the remainder were placed on arrival at Kaduna in specially prepared pens affording protection from the mongoose and wild cat. The site was elevated, well drained, and previously free from poultry.

The native fowl is described as having the appearance of an ill-conditioned bantam, and its utility qualities either as a table fowl or as a producer of eggs are very poor. The country experiences great extremes of temperature. During the hot (which is also the wet) season from April to September the thermometer rises to 104° F. in the shade: while during the cold dry season, from October to March, it drops to 45° F. There is almost continuous rain for six months, and the country is parched and produces no natural green food for the remaining six months. The staple food of the country is *Dari* (*Sorghum vulgare*) known as guinea corn. It is also the corn commonly fed to the poultry, and in the case of the imported fowls it was dug into the litter

first thing in the morning, followed at 4 p.m. by a soft feed of boiled sweet potato (yam) mixed with green bone. In the dry season, when there is no natural green food, chopped lettuce grown specially in gardens which are watered daily was fed to the birds. From January to March mussels obtained from the shrunken river beds were given, the pounded shells being fed as shell grit all the year round. Some maize was fed to growing stock, but wheat and other European grains are scarce.

With the exception of a short period at the beginning of the dry season in October, hens lay eggs all the year round in Northern Nigeria. Moulting takes place between August and November. As there is no skilled labour on the Kaduna breeding station, only natural hatching is resorted to, and this goes on throughout the year, the best results being in March. The percentage of eggs hatched varies from 60 to 90. Newly-hatched chicks are fed on broken wheat, broken dari and millets, and the larvæ of termites (white ants), boiled rice being added a few days later. Charcoal is fed to birds of all ages, and chickens have it powdered in their soft food (yams). Glauber salts and iron sulphate are put in the drinking water for 24 hours each week, and sulphur is mixed in the soft food in very hot weather. The problem of insect pests is a serious one, lice, red mite, and poultry tick being common among the native poultry, the last named being much dreaded as a disease carrier. As a preventive, all the birds on the station are dipped once a quarter in a 5 per cent. paraffin emulsion, while any houses badly infested are burned. This treatment has proved very successful. The only disease from which the imported poultry have suffered so far is chicken pox, which is enzootic among the native fowl and was probably introduced with the bran bought at a local market; no native fowls are kept within a quarter of a mile of the breeding station. This disease ran through the whole yard, but yielded readily to antiseptic treatment, there being no mortality.

No egg records are available, as the number of birds has varied and all the hens have been used regularly for sitting. It is hoped to raise on the breeding station a large number of pure bred fowls, and in the first place to distribute the cockerels (by sale) to the chiefs of the villages in order to improve the native fowl by crossing. The first crosses with the native fowl are half-caste in appearance and intermediate in size between the imported and native breeds. Over 100 of the pure-bred cockerels reared at the station have already been distributed over an area extending from Sokoto to Lake Chad.

NOTICES OF BOOKS.

The Nutritive Value of Lard.—(J. C. Drummond, J. Golding, S. S. Zilva and Katharine H. Coward : The *BIOCHEMICAL JOURNAL*. Vol. XIV, No. 6, December, 1920. Cambridge University Press.) During the last few years considerable attention has been devoted to the study of the distribution of the so-called fat-soluble accessory factor, or vitamin A, in naturally occurring oils and fats. Investigations tend to show that the oils and fats derived from the animal kingdom are, as a rule, decidedly richer sources of this essential dietary constituent than those prepared from vegetable sources. Most authorities, however, regarded lard as an exception, having found it practically devoid of vitamin A. Quite early in the study of growth-promoting vitamins it was observed that butter fat was of much higher nutritive value for growth than lard. This difference has been ascribed to the fact that lard is a fat derived from storage depots, whereas butter fat is a product of the synthetic processes of the mammary gland. The importance of determining definitely why lard is thus deficient is, therefore, obvious. The first series of experiments by the group of workers named above were carried out on a litter of Berkshire pigs at the farm attached to University College, Reading, while the rat feeding tests took place at University College, London, and the results were published in the *Biochemical Journal* in December last.

It is now experimentally proved that the mammalian organism does not possess the power to synthesise the vitamin A, and that it is dependent upon its diet for supplies of this essential factor. Hence it was concluded that investigations should proceed along two lines, (1) a study of the influence of the diet of pigs on storage of the vitamin in the fat depots, and (2) an investigation of the influence of the technical processes of lard manufacture on the vitamin when present in the pig fat.

The results of the experiments are summarised as follows :—

(1) The pig is able to store up supplies of vitamin A in the body fat when fed upon a diet containing ample supplies of that factor, as for example when grass fed.

(2) When the diet of the pig is deficient in vitamin A, as for example when it consists almost entirely of toppings and whey, no appreciable amounts of that dietary factor can be detected in the body fat.

(3) The processes employed in the manufacture of lard on a large scale in this country cause a very marked destruction of the vitamin present in the pig fat.

(4) The low nutritive value of lard is therefore believed to be due to two causes. First, the diet usually given to fattening pigs in this country is seldom rich in vitamin A, so that the average sample of pig fat contains little or none of that substance. Secondly, the processes of lard manufacture undoubtedly cause the destruction of much of the vitamin present in the original pig fat, probably owing to the exposure of the fat to oxygen at high temperature.

Poultry Keeping.—(C. A. Flatt. London: Methuen & Co. Price 5s. 6d.) Poultry farming is a highly specialised business, and, as such, requires considerable practical experience if it is to be made a success.

Mr. Flatt makes this important fact amply clear in a straightforward way, and in the simplest possible language; his book should, therefore, be of particular value to the beginner. More importance is attached to practice than to theory, and rightly so. Many people still think that they have only to put any kind of hen into any kind of hovel, when she will of course lay large numbers of eggs. Unfortunately for that theory, the hen is a creature of nature, and must be treated accordingly and not as a machine. The amount of detail which the poultry keeper is called upon to superintend is so considerable that no one need imagine that he is likely to make a success of the business with less than a year's practical training. Moreover, it is such a useful adjunct to almost every other form of agriculture, fruit growing and horticulture in particular, that it behoves those interested in such forms of husbandry to consider whether this branch of agriculture could not be advantageously combined with their other operations, (1) because of the assistance poultry afford in keeping down pests, and (2) because of the great value of poultry manure when properly applied, quite apart from (3) the profits that would accrue from the poultry themselves when properly cared for. These important considerations are emphasised throughout Mr. Flatt's book.

Poultry keeping does not involve hard labour, but it does necessitate unremitting attention to detail, and often long hours, particularly when the successful rearing of chickens is the object in view. Chicken rearing, by the way, is quite the most absorbing branch of poultry keeping, and can be conducted with great advantage as an adjunct to dairying, since skim and sour milk are of especial value to growing stock.

The reader will find the chapter on poultry foods of great interest, as it deals with a highly technical subject in a lucid way. Ducks, turkeys and geese are appropriately dealt with, and in relation to the commoner poultry diseases it is shown that prevention is far better than cure.

The results of Mr. Flatt's wide experience as a poultry-keeper and as Poultry Instructor to the Devon County Council and other bodies are offered to the public in a concise and simple form.

The preliminary tabulation of the Agricultural Returns collected on the 4th June, 1921, in respect of agricultural holdings of over one acre in England and Wales shows that the total area under all crops and grass is 26,139,000 acres, a decrease since last year of 368,000 acres. On the other hand, the area of rough grazings (which comprises mountain, heath, moor, down and other rough land used for grazing) is now 4,555,000 acres, or 393,000 acres more than at the same date in 1920.

**Agricultural Returns,
England and Wales,
1921.**

Cereals.—The area of wheat, 1,978,000 acres, is 103,000 acres more than in 1920, and, excluding the war years, is the largest recorded since 1898. Barley and oats, on the other hand, have declined, the former by 202,000 acres and the latter by 127,000 acres. The area under barley, 1,435,000 acres, is less than the pre-war level, but that of oats, 2,145,000 acres, is higher than in any pre-war year since 1908. The total area under the three cereal crops (including mixed corn) is 5,694,000 acres, or 400,000 acres more than the average of the ten years 1905—1914.

Beans and Peas.—The area of beans is 246,600 acres, or 10,500 acres less than in 1920, while peas show a much greater decline, and this year's area of 142,400 acres is smaller than in any year before the war.

Potatoes.—The area occupied by potatoes has again increased, and at 557,000 acres is the largest recorded, with the exception of that of 1918.

Roots.—A decline of 97,100 acres on last year is shown in the area of turnips and swedes, and this year's area of 894,000 acres is the smallest on record. It should be mentioned that, at the date of the returns, much of the

PRELIMINARY STATEMENT of Acreage under Crops and Grass and Numbers of Live Stock in England and Wales on 4th June, 1921.

DISTRIBUTION.		1921.	1920.	INCREASE.		DECREASE	
		<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Per Cent.</i>	<i>Acres.</i>	<i>Per Cent.</i>
TOTAL ACREAGE under all CROPS and GRASS		26,139,000	26,507,000	—	—	368,000	1·4
*ROUGH GRAZINGS		4,555,000	4,162,000	393,000	9·4	—	—
ARABLE LAND		11,618,000	12,020,000	—	—	402,000	3·3
PERMANENT GRASS {	For Hay	4,054,000	4,395,000	—	—	341,000	7·8
	Not for Hay	10,467,000	10,002,000	375,000	3·7	—	—
	TOTAL	14,521,000	14,487,000	34,000	0·2	—	—
Wheat .. {	Autumn Sown	1,911,000	1,793,000	118,000	6·6	—	—
	Spring Sown	67,000	82,000	—	—	15,000	18·3
TOTAL		1,978,000	1,875,000	103,000	5·5	—	—
Barley		1,435,000	1,637,000	—	—	202,000	12·3
Oats		2,145,000	2,272,000	—	—	127,000	5·6
Mixed Corn		136,400	147,500	—	—	11,100	7·5
Rye		79,400	95,600	—	—	16,200	16·9
Beans		246,600	267,100	—	—	10,500	4·1
Peas		142,400	165,700	—	—	23,300	14·1
Potatoes		557,000	544,600	12,800	2·4	—	—
Turnips and Swedes		894,300	991,400	—	—	97,100	9·8
Mangold		374,800	385,900	—	—	11,100	2·9
Cabbage, Savoys and Kale		58,000	62,100	—	—	4,100	6·6
Kohl-rabi		9,900	11,000	—	—	1,100	10·0
Rape		81,900	100,300	—	—	18,400	18·3
Vetches or Tares		103,700	121,700	—	—	18,000	14·8
Lucerne		47,400	44,500	2,900	6·5	—	—
Mustard		45,200	71,900	—	—	26,700	37·1
Brussels Sprouts		12,500	12,600	—	—	100	0·8
Cauliflower or Broccoli		8,600	8,800	—	—	200	2·3
Carrots		8,200	9,600	—	—	1,400	24·6
Onions		2,900	4,500	—	—	1,600	35·6
Sugar Beet		8,300	3,900	5,300	176·7	—	—
Flax for Fibre		1,700	9,400	—	—	7,700	81·9
Linseed		6,100	12,900	—	—	6,800	52·7
Hops		25,100	21,000	4,100	19·5	—	—
Small Fruit		73,300	58,800	14,500	24·7	—	—
CLOVER and ROTATION GRASSES {	For Hay	1,757,000	1,674,000	83,000	5·0	—	—
	Not for Hay	791,000	774,000	17,000	2·2	—	—
	TOTAL	2,548,000	2,448,000	100,000	4·1	—	—
BARE FALLOW		506,000	567,000	—	—	61,000	10·8

* Mountain, Heath, Moor, Down and other rough land used for grazing.

land intended for turnips had not actually been sown, and the character of the season has been such that a proportion of this land may now be devoted to other crops for fodder, such as vetches. There has also been a small decline in the area of mangold, which at 375,000 acres is the smallest for 20 years.

Other Crops.—Most of the other crops have declined in area, the most noticeable decreases occurring in the case of mustard, flax for fibre, linseed and onions. The decline in the fodder crops—cabbage, kohl-rabi, rape and vetches—is on the whole less than the general increase noted last year. The area of sugar-beet is nearly three times that of last year, whilst hops again

show a substantial increase. According to the returns the area under small fruit has increased by 14,500 acres, or nearly 25 per cent., the total area being 73,300 acres, which is about the same as in 1916.

Clover and Rotation Grasses.—The area of clover and rotation grasses has increased by 100,000 acres to 2,548,000 acres, of which 1,757,000 acres were reserved for hay. Including permanent grass, the total area reserved for hay this year was 5,811,000 acres, as compared with 6,069,000 acres in 1920.

Horses used for agricultural purposes (including mares kept for breeding) have increased by 33,600. Other classes show slight reductions, and the net increase in horses on agricultural holdings is 18,700.

LIVE STOCK.

	No.	No.	No.	Per Cent.	No.	Per Cent.
Horses used for Agricultural purposes (including Mares for Breeding)	822,500	788,900	34,600	4.3	—	—
Unbroken Horses	233,200	235,500	—	—	2,300	1.0
(including Stallions)	92,300	97,360	—	—	5,000	5.1
Other Horses	236,400	244,000	—	—	7,600	3.1
TOTAL OF HORSES	1,384,400	1,365,700	18,700	1.4	—	—
Cows and Heifers in Milk	1,875,900	1,827,700	48,200	2.6	—	—
Cows in Calf, but not in Milk	251,800	243,000	8,800	3.6	—	—
Heifers in Calf	373,600	282,100	91,500	32.4	—	—
Other Cattle :—Two years and above	1,001,300	1,177,900	—	—	176,600	15.0
" " One year and under two	893,400	1,109,000	—	—	215,600	19.4
" " Under one year	1,119,600	907,100	212,500	23.4	—	—
TOTAL OF CATTLE	5,515,600	5,546,800	—	—	31,200	0.6
Ewes kept for Breeding	5,308,300	5,108,500	199,800	3.9	—	—
Other Sheep :—One year and above	2,861,900	3,004,800	—	—	142,900	4.8
" " Under one year	5,636,000	5,263,400	366,600	7.0	—	—
TOTAL OF SHEEP	13,806,200	13,382,700	423,500	3.2	—	—
Sows kept for Breeding	335,800	289,500	46,300	16.0	—	—
Other Pigs	2,169,900	1,704,400	465,500	27.3	—	—
TOTAL OF PIGS	2,505,700	1,993,900	511,800	25.7	—	—

Cattle.—Although the total number of cattle shows a small decline on last year of 31,200 head, the figures are nevertheless satisfactory in that the only decreases recorded are confined to cattle one year old and over (other than breeding animals), and are largely consequential on the heavy decline in the number of animals under two years noted last year. The increase in calves is satisfactory, and, taken in conjunction with the increase in breeding animals, suggests that the number of cattle in the country will shortly rise to pre-war figures. The total number of cows and heifers, in milk or in calf, is 2,501,300, or 148,500 more than last year, and is larger than in any previous year with the exception of 1918 and 1919.

Sheep.—The number of sheep, which has been declining heavily in recent years, has now increased by 423,500 to 13,806,000—a noticeable feature being the increase of 200,000 in the case of ewes kept for breeding.

Pigs have increased by the large figure of 511,800 (over 25 per cent.) to 2,505,700, the largest total recorded since 1911. The increase of 46,300 in the number of sows kept for breeding, although proportionately less than in the case of other kinds, is especially satisfactory.

ACREAGE OF HOPS IN ENGLAND & WALES, 1921.—

The following is a preliminary statement compiled from the Returns collected on the 4th June, 1921, showing the ACREAGE under **Hops** in each COUNTY of ENGLAND in which Hops were grown, with a COMPARATIVE STATEMENT for the Years 1920 and 1919.

COUNTIES, &C.				1921.	1920.	1919.
				<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>
KENT ...	{	East ...	...	4,000	3,260	2,530
		Mid ...	...	5,420	4,520	3,650
		Weald ...	...	6,640	5,710	4,380
		Total, Kent ...	...	16,060	13,490	10,560
HANTS ...	...	...	...	1,040	840	760
HEREFORD ...	...	...	...	3,510	2,990	2,420
SURREY ...	...	...	...	200	170	180
SUSSEX ...	...	...	...	2,270	1,790	1,410
WORCESTER ...	...	...	...	1,960	1,660	1,370
OTHER COUNTIES	...	...	...	80	60	50
TOTAL ...				25,120	21,000	16,750

The Ministry's set of small model poultry houses which have been exhibited at certain shows have proved of considerable interest to many visitors, and inquiries have been received for working drawings of houses capable of erection at a minimum expense of money, time and labour. Plans have accordingly been prepared as follows:—

1. *Drawings of a Fowl-House for 6-9 Birds.*—These are sketches of the framing of a house suitable for back-yard poultry-keepers, for birds kept on the intensive system.

2. *Drawings of a Duck-House 16 ft. by 10 ft.*—These are suitable for "utility" duck-keeping.

3. *Drawings of a Hen-House 8 ft. 6 in. by 6 ft. 8 in. by 7 ft. 6 in. high.*—These are suitable for use on free range or farm. The house can be made portable if desired.

4. *Drawings of a House for 25 Birds or Double Breeding Pen.*—The house can be used for either purpose without structural alteration.

5. *Drawings of an 11 ft. Laying House.*—This house has been designed in sections, each capable of holding 25 birds, and can be enlarged by the addition of extra sections. There is perch room in each section for 27 birds, thus preventing over-crowding on perches.

(4) and (5). These houses have been designed to obtain the maximum amount of ventilation and light, together with economy of space, consistent with proper perch accommodation. Special care has been taken to keep the size of timber used in the construction as small as possible and easy of erection.

The plans may be obtained from H.M. Stationery Office, or direct from the Ministry's Office, 10, Whitehall Place, London, S.W.1., price 3d. per copy.

Export of Live Stock to Argentina.—The Argentine Government, in a Decree issued on the 14th July, authorised the importation of live stock into Argentina from the United Kingdom, and made it a condition that the stock must be carried on ships which make a direct voyage from British to Argentine ports. This condition has in practice been found to create certain difficulties in connection with the export of stock from the United Kingdom to Argentina, since most vessels from British to Argentine ports call *en route* at Monte Video, Uruguay.

As a result of representations by the Ministry of Agriculture and Fisheries, the Argentine Government issued a further Decree excepting the port of Monte Video from the condition mentioned.

Leaflets issued by the Ministry.—Since the date of the list given on page 478 of the August issue of this *Journal*, one new leaflet has been issued and circulated:—

No. 364.—Coccidiosis in Rabbits and Poultry.

The following leaflets have been revised and brought up to date:—

No. 46.—The Stem Eelworm.

„ 70.—The Renovation of Neglected Orchards.

„ 129.—Winter Egg Production.

„ 320.—The Manuring of Vegetable Crops.

The following leaflet has been re-written:—

No. 283.—Storing of Apples and Pears for Home use.

The following leaflets have been withdrawn from circulation.

No. 149.—Threshing of Barley.

„ 247.—Shot-hole Fungus.

„ 323.—The Profitable Utilisation of Surplus Milk.

„ 359.—Bracken as litter.

Rabies.—There has been no outbreak of Rabies in any part of Great Britain since that referred to in the August issue of the *Journal*, viz., at Southampton on 5th July in a dog which died on 4th June. As from 8th August, all restrictions were withdrawn from the small area lying to the south of Swindon.

Foot-and-Mouth Disease.—An outbreak of Foot-and-Mouth Disease occurred at Dilhorne, near Stoke-on-Trent, on the 10th August, after a period of over two months freedom from disease.

The usual restrictions were at once imposed in respect of the district lying within 15 miles of the infected premises, and except that on the 11th August, animals on the immediately adjoining farm were found to be affected, there had been no extension of disease up to the time of going to press. The slaughter of all the animals involved has been completed.

Revocation of the Testing of Seeds Order.—In exercise of the powers conferred upon them, the Board of Trade have revoked as on 1st August, 1921, the Testing of Seeds Order, 1918, as amended, but without prejudice to any proceedings in respect of any contravention thereof.

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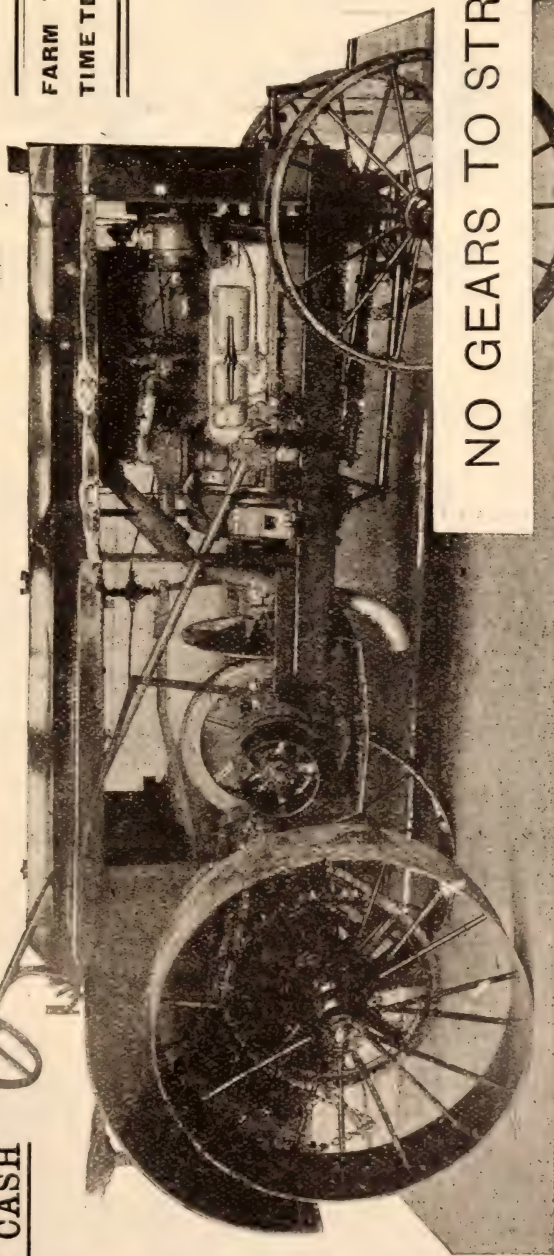
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CATTLE—continued.

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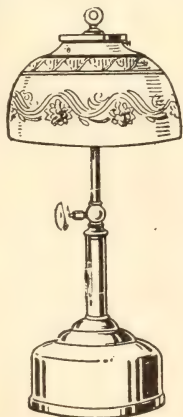
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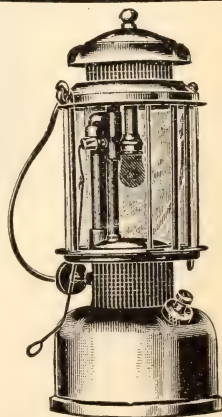
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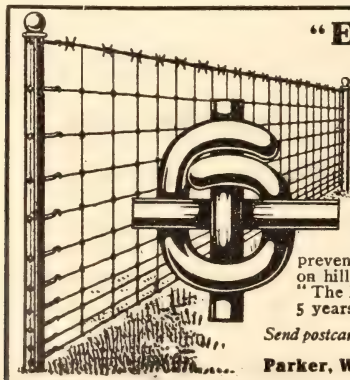
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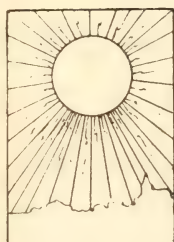
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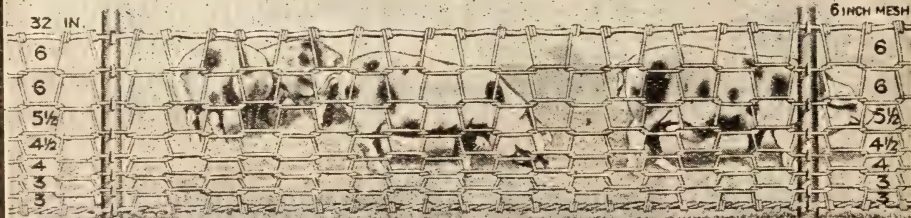
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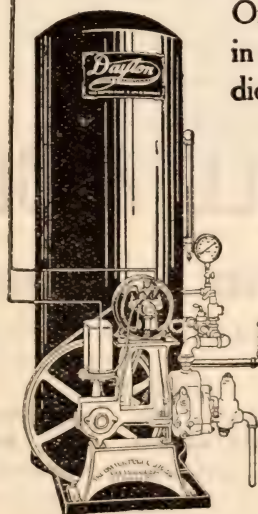
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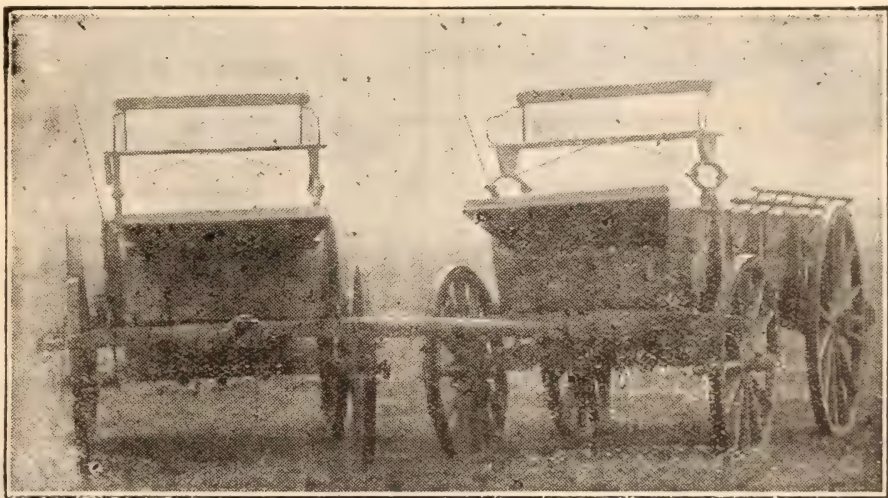
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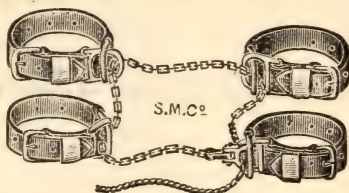
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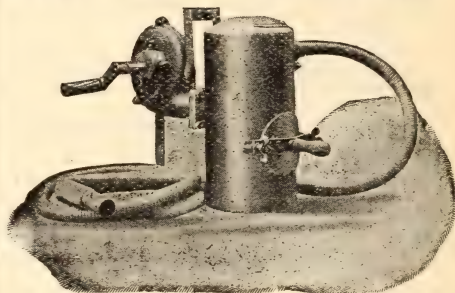
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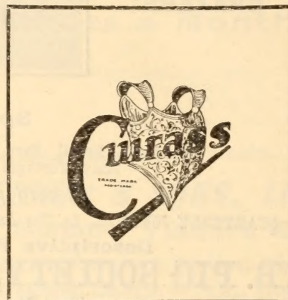
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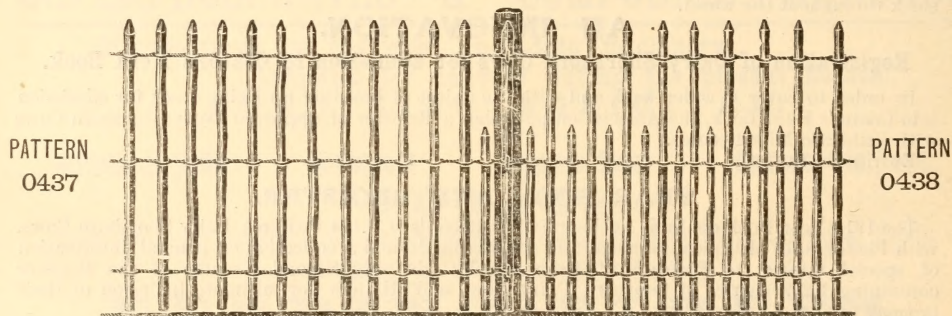
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